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Site: MISSOURI ELECTRIC  
ID # MCD980965982  
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# REPORT FOR BASELINE HUMAN HEALTH RISK ASSESSMENT

## VOLUME I OF III

### MISSOURI ELECTRIC WORKS (MEW) SITE CAPE GIRARDEAU, MISSOURI

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July 5, 2005  
PROJECT NO: H0931

MEW Site File  
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ENVIRONMENT AND WATER RESOURCES

# REPORT FOR BASELINE HUMAN HEALTH RISK ASSESSMENT

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## EXECUTIVE SUMMARY

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This report presents the results of a baseline human health risk assessment prepared for the Missouri Electric Works (MEW) Site Trust Fund Donors for the property formerly occupied by MEW, in Cape Girardeau, Missouri. The Final Baseline Human Health Risk Assessment (BHHRA) Report was submitted to the United States Environmental Protection Agency (U.S. EPA) on July 28, 2004. The report was submitted following, or in conjunction with the Draft Groundwater Remediation Feasibility Study Report (Komex, 2004a), the Draft Groundwater Modeling Report (Komex, 2003f), the Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2004b), and the Draft Groundwater Remedial Investigation Report (Komex, 2004c). In response to U.S. EPA comments on the July 28, 2004 BHHRA Report received in November, 2004, the BHHRA report (Komex, 2005a) was jointly transmitted with the Groundwater Remedial Investigation Report (Komex, 2005b), the Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2005c), and the Fractured Bedrock Groundwater Remediation Feasibility Study (Komex, 2005d). Comments were provided for the above referenced documents by the U.S. EPA at meetings on April 8, April 27, and April 28, 2005 and each of the documents have been revised to incorporate the agency comments. These revised documents present the results, evaluation, discussion and conclusions of investigations at the Site and support a risk management decision for selection of an appropriate remedy for the Site.

This BHHRA document, in conjunction with the Groundwater Remedial Investigation (RI) Report (Komex, 2005e) Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2005f) and the Fractured Bedrock and Alluvium Groundwater Remediation Feasibility Study (Komex, 2005g), will complete the U.S. EPA directive to, "characterize the rate and extent of contamination from waste material in the groundwater at, or from the Site." as implemented in the Consent Decree Order on March 9, 1998.

For the purposes of this report, the physical extent of the property where MEW conducted operations will be referred to as "the Property". The Site is defined by the area of soils that were impacted by concentrations of polychlorinated biphenyls (PCBs) above the Site-specific clean-up levels. The Site therefore includes areas on and off the Property and has a total surface area of approximately 6.8 acres (2.8 hectares [ha]).



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## Objectives

The objective of the risk assessment is to determine whether chemicals in groundwater at the Site pose a significant health risk to potential receptors in the area. The findings of the risk assessment will indicate potential concerns relative to the Site conditions.

## Approach and Methodology

The risk assessment has been conducted in accordance with the Draft Work Plan (Komex, 2003a) and addendum (Komex, 2003b). The work follows the procedures and methodologies described in relevant guidance documents from the U.S. EPA and consists of the following steps:

- **Data review and evaluation.** Available data pertaining to the Site are used to develop a conceptual exposure model and to determine chemicals of potential concern (COPC).
- **Chemical selection.** COPC are selected to ensure that the most significant potential for human exposure and risk is evaluated. Subsequent steps of the risk assessment rely on the selected chemicals.
- **Exposure assessment.** Conceptual exposure scenarios are developed for the Site to describe the potential exposures and provide a basis for quantifying those exposures. In support of the exposure assessment, computer-aided fate and transport modeling has been performed to project exposure point concentrations.
- **Toxicity assessment.** Toxicity information is reviewed to determine acceptable reference doses and carcinogenic slope factors for the COPC.
- **Risk characterization.** Risk characterization is the estimate of the potential health risk based on the selected COPC, the exposure scenarios, exposure point concentrations established in the exposure assessment, and chemical-specific toxicity information.
- **Uncertainty analysis.** This is a qualitative evaluation of the inherent uncertainty associated with the risk results as a product of the information and assumptions used in their derivation.
- **Findings.** The final step in the process is the development and presentation of conclusions that can be drawn from the findings of the risk assessment.

## Conceptual Exposure Model and Selection of COPC

A Conceptual Exposure Model (CEM) was developed for the Site based on the following future land uses:



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- Commercial/industrial use at the Property. A deed restriction will be applied to the Property to ensure that groundwater beneath the Property cannot be used for water supply.
  - Residential use on wetland area. City zoning for this area is light industrial/commercial. The assumption of residential land use is therefore considered conservative.

The CEM identified the following potentially complete exposure pathways that should be quantified:

- Exposure to an adult worker at the Site from the inhalation of COPC vapors that have migrated from the subsurface through the floor into the building;
- Exposure to an off-Site construction worker from direct contact with shallow groundwater in the wetland area; and
- Exposure to an off-Site resident from: (1) inhalation of COPC vapors that have migrated from the subsurface through the floor into the building; (2) ingestion/dermal contact of COPC in groundwater used for water supply; (3) inhalation of COPC arising from use of groundwater; and (4) ingestion and dermal contact with COPC in surface water during recreational use of the creek. Exposure to an off-Site resident not using groundwater at the Site for water supply was also considered.

Exposure to possible trespassers from recreational use of the creek (dermal contact and incidental ingestion) may also occur. Recreational use of the creek has been considered as part of the residential scenario. The relevant results of the assessment of risks to residential receptors can therefore be used for assessing the risk to trespassers.

COPC were identified by comparison of maximum concentrations detected in groundwater with risk screening values. The U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for the tap water pathway have been used to derive these screening values. There were 52 compounds selected as COPC, of which 48 have been quantitatively evaluated in this BHHRA. Thirty one of the organic COPC have never been detected in groundwater at the Site but have been selected as COPC because the maximum method detection limit (MDL) for these analytes exceeds the applied screening toxicity values. Four additional non-detected chemicals were retained as COPC but were not evaluated quantitatively in this risk assessment due to the absence of available toxicity data.

Inorganic compounds were investigated during the initial RI work in the late 1980 and early 1990s and it was determined that the inorganic concentrations at the Site did not indicate the presence of contamination associated with the operations of MEW. (EarthTech 1990, U.S. EPA



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1990 Record of Decision [ROD]). Based on this evaluation and at the direction of the agency, inorganic compounds are not listed as COPC.

### *Quantification of Exposure*

Fate and transport modeling was used to predict point of exposure (POE) concentrations for the identified receptors. Two types of modeling have been conducted: (1) groundwater modeling to predict reasonable maximum exposure (RME) concentrations of organic COPC that could occur in groundwater off Site; and (2) vapor modeling to predict RME concentrations of organic COPC that could occur in indoor air as a result of impacted groundwater beneath a building.

The groundwater modeling was conducted in two steps as documented in the Groundwater Modeling Letter (Komex, 2005f): (1) fracture network modeling was conducted using Fracman to improve the understanding of COPC migration within the fractured limestone and to validate the use of an equivalent porous medium (EPM) model approach; and (2) the EPM was used to predict POE concentrations for use in the exposure assessment.

The EPM model was developed using reasonable worst-case estimates of parameter values. This included the use of maximum observed groundwater concentrations for the source concentrations of detected organic COPC at the Site and one-half the MDL for non-detected COPC. The model was used to predict POE concentrations of organic COPC in groundwater at three hypothetical drinking water well locations (Well A, Well B and Well C), shallow groundwater within the wetland area and surface water within the creek. Although the EPM model can reasonably predict COPC concentrations in a simulated fracture and model results are valid for scales of evaluation that are likely to include one or more fractures, the exact occurrence, location and geometry of fractures in the field are not known. Therefore, model results can be used to assess worst-case risk to hypothetical receptors (by wells modeled as being installed in simulated fractures); however, the results can not be used at the scale necessary to precisely locate wells for either remediation or water supply purposes.

As outlined in U.S. EPA Guidance, the Johnson-Ettinger model was used to predict the concentrations of COPC in indoor air arising from the intrusion of soil vapor into a building. The 95<sup>th</sup> percentile upper confidence limit (UCL) mean groundwater concentrations derived from wells located in the source zone were used for calculating indoor air concentrations for a worker at the Property. The RME concentrations in shallow groundwater off Site predicted by the EPM were used for calculating indoor air concentrations for a resident living on the wetland area.



Exposure equations and factors were obtained from the U.S. EPA Risk Assessment Guidance for Superfund (RAGS) for quantifying exposure for each of the pathways identified in the CEM. Parameter values were selected to ensure that the RME was quantified. Parameter values were also collated for central tendency exposure (CTE).

### *Toxicological Assessment*

Toxicological data were obtained from the appropriate sources following U.S. EPA's hierarchy. For the purposes of this risk assessment, 37 compounds were considered carcinogenic. Reference doses and cancer slope factors were obtained for these compounds, where available. Fifteen compounds were treated as non-carcinogens. Reference doses were obtained for these compounds, where available. A range of cancer slope factors was identified for trichloroethene (TCE). Three slope factors representing this range have been used for characterizing risks from TCE.

### *Risk Characterization*

The results of the exposure assessment have been combined with the toxicological data to allow the risks associated with impacted groundwater below and extending from the Property to be evaluated. A conservative approach has been adopted for both the exposure assessment and selection of toxicological parameters. The calculated RME risk factors for organic COPC using these conservative assumptions are presented below:



Receptor	Total Hazard Index (HI) For Organic COPC	Incremental Lifetime Cancer Risk (ILCR) For Organic COPC
Adult worker on MEW Property	0.1	$1 \times 10^{-5}$ to $6 \times 10^{-6}$
Adult off-Site construction worker in wetland area	2	$5 \times 10^{-7}$ to $4 \times 10^{-7}$
Resident (child and/or adult) on wetland area using impacted groundwater for water supply (Hypothetical Well D)	124	$1 \times 10^{-2}$
Resident (child and/or adult) on wetland area with municipal water supply (Hypothetical Well C)	0.06	$2 \times 10^{-6}$ to $3 \times 10^{-7}$
Trespasser	0.003	$3 \times 10^{-8}$

The calculated RME HI for organic COPC for the adult on-Site worker is 0.1. The RME ILCR for organic COPC for an adult worker ranges from  $1 \times 10^{-5}$  to  $6 \times 10^{-6}$ , depending on the TCE slope factor used. This ILCR is based on a 25-year exposure duration averaged over a 70-year life span.

The calculated RME HI for organic COPC for the adult off-Site construction worker in the wetland area is 2. The RME ILCR for organic COPC for an adult off-Site construction worker ranges from  $5 \times 10^{-7}$  to  $4 \times 10^{-7}$ , depending on the TCE slope factor used. This ILCR is based on a 1-year exposure duration averaged over a 70-year life span.

The EPM has shown that elevated concentrations of organic COPC could exist within the limestone and alluvial deposits beneath the wetland area. A range of risks has been calculated for a future resident using three hypothetical water supply wells located in the wetland area. The highest risk has been predicted for the residential receptor when the drinking water supply well is located within the plume of impacted groundwater. A maximum RME HI of 124 and an ILCR of  $1 \times 10^{-2}$  have been predicted for organic COPC for this scenario using the worst case concentrations predicted by the groundwater model. The ILCR values for the residential receptor are based on a 30-year exposure duration, including 6 years as a child and 24 years as an adult, averaged over a 70-year life span.

The maximum calculated RME HI for organic COPC for a resident that does not use groundwater for water supply or uses groundwater not impacted by organic COPC is 0.06. The



calculated ILCR for organic COPC for this scenario is  $2 \times 10^{-6}$  and  $3 \times 10^{-7}$ , depending on the slope factor used.

The calculated RME HI for organic COPC for a trespasser from recreational use of the creek (dermal contact and incidental ingestion) is 0.003. The calculated maximum ILCR for this scenario is  $3 \times 10^{-8}$ . The ILCR values for the trespasser are based on an exposure duration as defined for the off-Site resident.

The calculated CTE risk factors for organic COPC are presented below:

Receptor	Total Hazard Index (HI) For Organic COPC	Incremental Lifetime Cancer Risk (ILCR) For Organic COPC
Adult worker on MEW Property	0.09	$2 \times 10^{-6}$ to $1 \times 10^{-6}$
Adult off-Site construction worker in wetland area	0.5	$2 \times 10^{-7}$ to $1 \times 10^{-7}$
Resident (child and/or adult) on wetland area using impacted groundwater for water supply (Hypothetical Well D)	75	$3 \times 10^{-3}$ to $2 \times 10^{-3}$
Resident (child and/or adult) on wetland area with municipal water supply (Hypothetical Well C)	0.04	$4 \times 10^{-7}$ to $7 \times 10^{-8}$
Trespasser	0.001	$5 \times 10^{-9}$ to $4 \times 10^{-9}$

### Conclusions

Based on the U.S. EPA's acceptable risk range of  $1.0 \times 10^{-4}$  to  $1.0 \times 10^{-6}$ , and an acceptable HI of 1, the following conclusions are drawn from the risk assessment:

- Indoor vapor intrusion from impacted groundwater beneath the Property was assessed as the only potentially complete pathway for future on-Site workers. Risk quantification for organic COPC has shown no significant risk to future on-Site workers from this pathway.
- Dermal contact with and incidental ingestion of impacted shallow groundwater were assessed as the only potentially complete pathways for future off-Site construction workers. Risk quantification for organic COPC showed no significant cancer risk to future off-Site workers from this pathway. However, the assessment showed that there could be a significant non-cancer risk from organic COPC to future off-Site workers from this pathway



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- The use of impacted groundwater for water supply, indoor vapor intrusion from impacted groundwater and recreational use of the creek (dermal contact and incidental ingestion) were assessed as the only potentially complete pathways for future off-Site residents. Risk quantification for organic COPC showed no significant risk to future off-Site residents from indoor vapor intrusion and recreational use of the creek. The assessment showed that there could be a significant risk from organic COPC to future residents living in the wetland area if they were to use impacted groundwater as their water supply.
  - Risk quantification for organic COPC showed no significant risk to future residents living in the wetland area if they use an alternative water supply (*i.e.*, municipal water supply).
  - Recreational use of the creek (dermal contact and incidental ingestion) was assessed as the only complete pathway for trespassers on the wetland area. This pathway was quantified as part of the residential scenario and showed no significant risk from organic COPC. It has therefore been concluded that there is no significant risk from organic COPC to trespassers from recreational use of the creek.

In summary, the results of the risk assessment have demonstrated that the risk to adult workers at the MEW Property is unlikely to be significant. This is based on the assumption that a restriction is applied to the Property to prevent the usage of groundwater beneath it. Groundwater fate and transport modeling has indicated that the groundwater plume containing COPC could extend off Site to the southeast of the MEW Property beneath the wetland area. Exact prediction of the plume extent is not possible due to the uncertainties inherent in modeling COPC migration in fractured media. The risk assessment has shown that use of the potentially impacted groundwater beneath the wetland area could present a significant risk to receptors. It has also been demonstrated that there could be a significant risk from organic COPC to future off-Site construction workers in the wetland area.

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- A Laboratory Non-Conformances
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- C Groundwater Modeling
- D Groundwater Source Concentration Statistics
- E Johnson-Ettinger Output



## LIST OF ACRONYMS AND ABBREVIATIONS

ASL	above sea level
atm.m <sup>3</sup> /mol	partial pressure molar concentration
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
Cal-EPA	California Environmental Protection Agency
CDI	chronic daily intake
CEM	conceptual exposure model
cm	centimeters
COPC	chemicals of potential concern
CSF	cancer slope factor
CTE	central tendency exposure
EPM	equivalent porous medium
f <sub>oc</sub>	fraction of organic carbon
FS	feasibility study
gm	gram
ha	hectare
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
kg	kilograms
km	kilometers
Komex	Komex H2O Science, Inc.
K <sub>oc</sub>	organic carbon partition coefficient
L	Liters
LOAEL	lowest-observable-adverse-effect level
LOD	limit of detection
LOQ	limit of quantification
LQMP	Laboratory Quality Management Plan
m	meters
MDL	method detection limit
MEW	Missouri Electric Works
µg	micrograms



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µg/kg	micrograms per kilogram
µg/L	micrograms per Liter
mg	milligrams
mg.kg <sup>-1</sup> .d <sup>-1</sup>	milligrams per kilogram body weight-day
mg/m <sup>3</sup>	milligrams per cubic meter
NOAEL	no-observable-adverse-effect level
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
ppm	parts per million
PRG	preliminary remediation goal
PRTV	Peer Reviewed Toxicity Value
RAGS	Risk Assessment Guidance for Superfund
RAIS	Risk Assessment Information System
RCRA	Resource Conservation and Recovery Act
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
STD	Site Trust Fund Donors
STV	screening toxicity value
SVOC	semi-volatile organic compounds
TCE	trichloroethene
UCL	upper confidence limit
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOCs	volatile organic compounds



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# 1 INTRODUCTION

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Komex H<sub>2</sub>O Science Inc. (Komex) was commissioned by the Missouri Electric Works (MEW) Site Trust Fund Donors (STD) to conduct a baseline human health risk assessment of the MEW Site. This document presents the risk assessment, which has been conducted in accordance with the Risk Assessment Draft Work Plan (Komex, 2003a) and addendum (Komex, 2003b).

The Final Baseline Human Health Risk Assessment (BHHRA) Report was submitted to the United States Environmental Protection Agency (U.S. EPA) on July 28, 2004. The report was submitted following, or in conjunction with the Draft Groundwater Remediation Feasibility Study Report (Komex, 2004a), the Draft Groundwater Modeling Report (Komex, 2003f), the Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2004b), and the Draft Groundwater Remedial Investigation Report (Komex, 2004c). In response to U.S. EPA comments on the July 28, 2004 BHHRA Report received in November, 2004, the BHHRA report (Komex, 2005a) was jointly transmitted with the Groundwater Remedial Investigation Report (Komex, 2005b), the Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2005c), and the Fractured Bedrock Groundwater Remediation Feasibility Study (Komex, 2005d). Comments were provided for the above referenced documents by the U.S. EPA at meetings on April 8, April 27 and April 28, 2005 and each of the documents have been revised to incorporate the agency comments. These revised documents present the results, evaluation, discussion and conclusions of investigations at the Site and support a risk management decision for selection of an appropriate remedy for the Site.

This BHHRA document, in conjunction with the Groundwater Remedial Investigation (RI) Report (Komex, 2005e) Groundwater Flow and Transport Supplemental Modeling Letter Report (Komex, 2005f) and the Fractured Bedrock and Alluvium Groundwater Remediation Feasibility Study (FS) (Komex, 2005g), will complete the U.S. EPA directive to, "characterize the rate and extent of contamination from waste material in the groundwater at, or from the Site." as implemented in the Consent Decree Order on March 9, 1998.

## 1.1 OBJECTIVES

The objective of the risk assessment is to determine whether chemicals in groundwater at the Site pose a significant health risk to potential receptors in the area. The findings of the risk assessment will indicate potential concerns relative to Site conditions.



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## 1.2 METHODOLOGY

The risk assessment has been conducted in accordance with the Draft Work Plan (Komex, 2003a) and addendum (Komex, 2003b). The work follows the procedures and methodologies described in relevant guidance documents from the U.S. EPA. These include the following:

- Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual, Part A (U.S. EPA, 1989a);
- RAGS Volume I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals (U.S. EPA, 1991a);
- RAGS Volume I: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives (U.S. EPA, 1991b);
- RAGS Volume I: Human Health Evaluation Manual, Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments (U.S. EPA, 2001a);
- RAGS Volume I: Human Health Evaluation Manual Part E, Supplemental Guidance for Dermal Risk Assessment (U.S. EPA, 2004b);
- Guidance for Data Useability in Risk Assessment (U.S. EPA, 1992c);
- National Oil and Hazardous Substances Pollution Contingency Plan (U.S. EPA, 1990b);
- Exposure Factors Handbook (U.S. EPA, 1990a, 1997a);
- Child-Specific Exposure Factors Handbook (Interim Report) (U.S. EPA, 2002a);
- Dermal Exposure Assessment, Principles and Applications (U.S. EPA, 1992a);
- Integrated Risk Information System (IRIS) database (U.S. EPA, 2003a);
- Soil Screening Guidance (U.S. EPA, 1996b, c);
- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (U.S. EPA, 2002b);
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (U.S. EPA, 2002c);
- Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA, 2002d); and
- Superfund Exposure Assessment Manual (U.S. EPA, 1988c).

The methodology used to conduct the baseline risk assessment consists of seven steps. These are illustrated on **Figure 1-1** and are summarized below.



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### *Step 1: Data Review and Evaluation*

Readily available information related to operational history, hydrology, geology, waste characteristics, chemical concentrations, surrounding land uses, topography, climate, and local meteorology are collected and reviewed. The data are screened according to the data usability criteria established for risk assessment. This information forms the basis of the risk assessment.

### *Step 2: Chemical Selection*

Chemicals of potential concern (COPC) are selected to ensure that the most significant potential for human exposure and risk is evaluated, as required by the agencies. Subsequent steps of the risk assessment rely on the selected chemicals.

### *Step 3: Exposure Assessment*

Conceptual exposure scenarios are developed for the Site to describe the potential exposures and provide a basis for quantifying those exposures. Each exposure scenario addresses the source of the COPC, route or mechanism of exposure, and potentially exposed populations (known as "receptors"). The need to quantify potential exposures to each receptor is determined after a review of project files.

In support of the exposure assessment, computer-aided fate and transport modeling has been performed to project exposure point concentrations. Two types of modeling have been conducted: (1) groundwater modeling to predict reasonable maximum concentrations of COPC that could occur in groundwater off Site; and (2) vapor modeling to predict reasonable maximum concentrations of COPC that could occur in indoor air as a result of impacted groundwater beneath the building.

### *Step 4: Toxicity Assessment*

For each identified COPC, an understanding of its toxicity to humans as well as potential environmental effects is essential. Toxicity information, which includes carcinogenic and non-carcinogenic effects, is available for many compounds through regulatory agencies and scientific literature. This information is reviewed to determine acceptable reference doses and carcinogenic slope factors for the COPC.



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### *Step 5: Risk Characterization*

Risk characterization is the estimate of the potential health risk based on the selected COPC (Step 2), the exposure scenarios, exposure point concentrations established in the exposure assessment (Step 3), and chemical-specific toxicity information (Step 4). Included are the cancer risk estimates, non-cancer hazard indices, and a summary of assumptions used in the calculations.

### *Step 6: Uncertainty Analysis*

Step 6 involves the evaluation of the inherent uncertainty associated with the risk results as a product of the information and assumptions used in their derivation. A qualitative discussion is provided assessing the level of conservatism inherent in the risk values.

### *Step 7: Findings*

The final step in the process is the development and presentation of conclusions that can be drawn from the findings of the risk assessment. This information is useful in providing risk managers insight into the interpretation of the risk assessment results.

## **1.3 REPORT ORGANIZATION**

**Section 2** provides background information regarding the Site and its environment for use in the risk assessment. It describes the Site and surrounding area, its history, geology, and hydrogeology. The distribution of chemical concentrations within groundwater on and off the Site is also presented.

The COPC selection process is presented in **Section 3**. This includes a description of the data validation process and the procedure used for selecting COPC.

**Section 4** summarizes the toxicity information (both carcinogenic and non-carcinogenic effects) for COPC and identifies the toxicity criteria used to characterize potential health risks.

The conceptual exposure model for the Site is described in **Section 5**. This addresses future land use, COPC sources, potential exposure pathways, and potentially exposed populations. Through the Site conceptual exposure model, possible exposure pathways are identified, and those pathways deemed significant to the identified receptors are selected for quantitative evaluation.



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The methods for exposure point concentration calculation are presented in **Section 6**. The statistical methods for the evaluation of chemical data and fate and transport analysis to predict point of exposure concentrations are presented.

The quantification techniques for potential health risks to the exposed receptors are discussed in **Section 7**. This section presents the risk characterization methodology for the Site land use and associated exposure scenarios developed in **Section 5**.

A qualitative analysis of uncertainty within the calculation of risk is presented in **Section 8**, and a summary of the risk assessment findings are presented in **Section 9**.

The sources of information used in the development of this report are presented in **Section 10**.

A list of laboratory non-conformances is provided in **Appendix A**. The toxicological profiles for COPC are presented in **Appendix B**. The groundwater fate and transport modeling is presented in **Appendix C**. Statistical analysis of groundwater concentrations is provided in **Appendix D**, and the model output from the Johnson-Ettinger vapor modeling is presented in **Appendix E**.



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## 2 BACKGROUND INFORMATION

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The physical characteristics of the Site are described in detail in several Site investigation reports prepared by Komex (2001a, 2002a, 2003c). The following paragraphs summarize the published information as it relates to this risk assessment.

### 2.1 SITE DESCRIPTION

The MEW Property is located on a 6.4-acre (2.6-hectare [ha]) tract of land adjacent to Missouri State Highway 61 in a commercial area of Cape Girardeau, Missouri. The Property is bounded to the north and east by retail and office properties, to the south by retail properties, and to the west by Highway 61 (South Kings Highway) (**Figure 2-1**). Currently, the Property consists of a grass field with a single concrete building (used by the owner to store equipment) within the northwest corner.

The Site is defined by the area of soils that were impacted by concentrations of polychlorinated biphenyls (PCBs) above the Site-specific cleanup levels. The cleanup levels, as documented in the Site's Record of Decision (U.S. EPA, 1990c), were 10 parts per million (ppm) PCBs for soils to a depth of 4 feet (1.2 meters [m]) below ground surface (bgs), and 100 ppm at depths greater than 4 feet (1.2 m) bgs. The Site includes areas on and off the MEW property and has a total surface area of approximately 6.8 acres (2.8 hectares [ha]).

The MEW Property is situated on top of a flattened ridge that runs approximately southwest to northeast. This ridge separates the valley of the Cape LaCroix Creek to the north and a low-lying wetland area to the south (**Figure 2-1**). A small creek flows eastwards across the wetland area and joins the Cape LaCroix Creek approximately 0.7 miles (1.1 kilometers [km]) east of the Site. The Cape LaCroix Creek joins the Mississippi River 1.5 miles (2.4 km) to the southeast of the Property.

Ground surface elevation at the Property is approximately 405 feet (123.4 m) above sea level (ASL). To the south of the Site, the ground slopes downward to Wilson Road, which forms the northwestern boundary of the wetland area (**Figure 2-1**). The elevation of the wetland area varies from 360 feet (109.7 m) ASL at Wilson Road to 351 feet (107 m) ASL at the small creek in the wetland area. To the north of the Site, the ground slopes downward to the relatively flat valley bottom of the Cape LaCroix Creek. A runoff channel is located near the eastern boundary of the Property. This drains toward the wetland area to the southeast of the Site.



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## 2.2 SITE HISTORY

MEW has been at the present location since 1953. Until 1992, MEW sold, serviced, and rebuilt transformers, electrical motors, and electrical equipment controls. During past operations, MEW recycled materials from old equipment and recovered copper wire and dielectric fluid from transformers. The salvaged transformer oil was filtered through Fuller's Earth for reuse. Approximately 90 percent of the oil was recycled, and approximately 16,000 transformers were repaired or scrapped at the Property until it closed. The total volume of transformer oil that was not accounted for during this period has been estimated at 28,000 gallons (105,992 Liters [L]).

Soils impacted with PCBs were remediated during the period July 1999 through July 2000. This involved the excavation, treatment (by thermal desorption), and replacement of soils that had concentrations of PCBs above the Site-specific cleanup criteria.

## 2.3 CLIMATE AND METEOROLOGY

Cape Girardeau's climate is continental, due to the region's central location within the United States of America. Temperature in this region is subject to frequent fluctuation, varying between 24°F and 90°F seasonally between 1971 and 2000, and averages 57.2°F daily. For the same period, annual precipitation has averaged 46.5 inches and monthly between 3.2 inches and 5.1 inches. The wettest months are typically March through May, November, and December. Snowfall occurs between October and April, averaging 12.8 inches annually.

A tipping bucket rain gauge with a built-in data logger was installed on the Site in April 2001 to obtain Site precipitation data. In addition, daily precipitation data was obtained from the Cape Girardeau Municipal Airport, which is located approximately one mile (1.6 km) from the Site, for the period 1 March 2001 to 28 February 2002. The two sets of groundwater data show a good correlation with precipitation data ( $R^2 = 0.88$ ).

Rainfall has been recorded in each month since installation of the rain gauge at the Site. The total rainfall from 27 July 2001 until 15 October 2003 is approximately 150 inches, an average of 64 inches annually (adjusted for months not recorded), or approximately 5 inches per month. Typically, the highest rainfall has occurred in the months of April, May, September, and October. Exceptional months have been September and October 2003, when rainfall exceeded 17.5 inches and 20 inches, respectively. The largest event recorded in one day at the Site was 4.1 inches on September 23, 2003. The largest rainfall event recorded in one day at the Cape Girardeau Municipal Airport was 5.81 inches on 19 July 2001.



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## 2.4 GEOLOGY

### 2.4.1 REGIONAL GEOLOGY

The MEW Site is situated within the southeastern part of the state of Missouri, which contains exposures of geologic formations ranging in age from Late Paleozoic to present time. In the Cape Girardeau area, the uppermost formation is commonly a surficial, undifferentiated Pleistocene age loess deposit that consists predominantly of loosely consolidated silts and silty clays. Where the loess is encountered, it may vary in thickness up to 30 feet (9 m). The loess was deposited during an eolian erosional and depositional period during the Pleistocene age and lies on top of the Ordovician age limestone bedrock units of Cape Girardeau.

In the vicinity of the Site, the Pleistocene age loess of Cape Girardeau is underlain by the Plattin Formation. This is a 400-foot (122-m) thick limestone, which is slightly dolomitic and fossiliferous. This dips toward the northeast at a maximum of 2 degrees. The underlying Joachim Dolomite outcrops approximately 1.2 miles (1.9 km) to the southwest of the Site. The United States Geological Survey (USGS) solid geology map shows two faults running northwest to southeast passing close to the western boundary of the Site.

### 2.4.2 SITE GEOLOGY

The USGS surficial geology map shows that in the vicinity of the Site the Pleistocene loess is typically present on higher ground. Valley areas are shown to contain "terrace" and "alluvial" deposits. Boreholes drilled at the Site and in the wetland area confirm this change in surficial lithology.

The native, surficial soil at the Site consists of 15 feet (4.6 m) to 25 feet (7.6 m) thick loess classified as the Menfro Silt, underlain by a brownish-red gravelly clay. The Menfro silt consists of firm brown silty clay that is easily eroded and characteristically develops on loess-covered ridge tops and hillsides of 5 to 9 percent slope. The gravelly clay is derived from the weathering degradation of the Plattin Formation Limestone (limestone residuum soil).

The thickness of surficial deposits beneath the wetland area is known to vary from 20 feet (6.1 m) at monitoring well MW-15A by Wilson Road to 146 feet (44.5 m) at MW-20C. The greater alluvium thickness noted within the Wetland area is caused by a depression feature, which possibly might be a localized low, within a buried former river channel, in the surface of the underlying Plattin Formation Limestone. Evidence for this depression is apparent from the



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2003 geophysical survey. Boreholes drilled in this depression have shown that the surficial deposits in this area consist of silty sands.

- **Upper weathered zone** – typically 50 feet thick. This zone is characterized by vertical fractures with large apertures, approximately 23 feet apart. These fractures have been enlarged by dissolution, especially at fracture intersections. Fractures with apertures in excess of 3 feet have been observed. The major fracture solution features in this zone are infilled with silty loess deposits. Horizontal bedding plane fracturing is common, especially in the uppermost 10 feet of the bedrock.
- **Intermediate zone** – approximately 115 feet thick. This zone is characterized by persistent vertical fractures spaced 100 to 150 feet apart, with some degree of dissolution-related opening. Fracture apertures are significantly narrower than those in the upper weathered zone and are characterized by varying degrees of calcite and other mineral deposition. Very few horizontal bedding fractures were observed, however this may represent a transport pathway of some significance..
- **Deeper zone** – greater than 260 feet thick. This zone is characterized by occasional discrete vertical fractures more than 150 feet apart. Fractures are narrow and frequently infilled with mineral deposits. Horizontal bedding fractures are rare in this zone, however this may represent a transport pathway of some significance.

## 2.5 HYDROGEOLOGY

The hydrogeology of the Site and surrounding area has been inferred from data collected from wells on or near the Site (Komex, 2005e). The locations of these wells are shown on **Figure 2-2**.

The majority of wells at the Site are completed within the weathered zone of the bedrock with screened depths of less than 60 feet (18.3 m) bgs. Monitoring wells MW-5 and MW-6 are completed in the loess and monitoring wells MW-11 and MW-11A are completed within the intermediate and deep zones of the bedrock. Off-Site monitoring wells MW-16A, MW-16B, MW-20A, MW-20B and MW-21A were installed in alluvium (above the soil/rock interface), and wells MW-16C, MW-17A, MW-18, MW-20C and MW-21B were installed just above the soil/rock interface. The remaining wells (MW-12, MW-13, MW-14, MW-15A, MW-15B, and MW-17B) were installed in the Plattin Formation Limestone.

Analysis of groundwater level hydrographs from monitoring wells MW-3 (completed in the weathered zone of the limestone) and MW-11 (completed in the intermediate zone) show that groundwater within the upper 165 feet (50.3 m) of limestone has hydraulic continuity. Monitoring well MW-11A, completed in the deep limestone, has a different hydrograph



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response than MW-3 and MW-11. This suggests that there is limited hydraulic continuity between the intermediate and deep limestone.

The groundwater table at the MEW Property is approximately 40 feet (12.2 m) bgs and is generally within the limestone. Seasonal fluctuations of up to 5 feet (1.5 m) have been observed in wells on the MEW Property. The loess is generally unsaturated, with the exception of some perched water (observed in MW-6A) and where the loess deposits occur within fractures of the bedrock below 40 feet bgs.

Monitoring at the Site has shown that groundwater flows southeast towards the creek (**Figure 2-2**). An upward hydraulic gradient has been observed at well cluster MW-16A, B, and C and MW-20A, and B, which suggests that groundwater, within the limestone, is discharging to the creek via the surficial deposits. Groundwater piezometry within the limestone is relatively complex due to the presence of fractures.

The majority of flow within the limestone is interpreted to occur within the fractures of the weathered and intermediate zones of limestone. The limestone within the deep zone is described as competent with few fractures. Any fractures that are present within this zone are mostly infilled and, consequently, there is unlikely to be significant groundwater flow within this zone.



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## 3 SCREENING OF CHEMICALS

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Throughout the course of a site investigation, numerous soil, surface water and groundwater samples are collected. These samples are typically designed to address specific site characterization issues, and may not be suitable for use in a health risk assessment. A detailed data evaluation process was completed to determine the validity and usefulness of the sample results in a quantitative risk assessment (U.S. EPA, 1992b).

Once the data are determined to be valid and of sufficient quality to be used in a quantitative risk assessment, further data analysis was employed to identify the COPC. The resulting COPC were used throughout the remainder of the risk assessment process. The following presents the site-specific approach to data validation and screening which was taken for the MEW Site risk assessment.

### 3.1 DETERMINATION OF DATA USEABILITY

The data validation process for risk assessment has been conducted in three stages:

- **Data review.** This involves the compilation and review of Site-related documentation and analytical data;
- **Data screening.** The identification of data that reflect current site conditions and are relevant to the risk assessment; and
- **Data validation.** This includes a review of sampling protocols and documentation, the determination of data sources, and an examination of data qualifiers and flags to identify the data that are suitable for use in the risk assessment.

#### 3.1.1 DATA REVIEW

Numerous phases of site investigation have occurred at the Site and, as a result, a large amount of data is available for review. Data evaluated for use in the risk assessment include:

- Hydrogeological Investigation Report (EarthTech, 1990);
- Supplemental Hydrogeological Investigation Report (EarthTech, 1991);
- Quarterly Groundwater Monitoring Reports (Komex 2001d, 2001e, 2002d, 2002e, 2003b, 2003c, 2003d, 2004d, 2004e, 2004f, 2004g, 2004h, and 2005h);
- Re-Evaluation of Groundwater Conditions and Conceptual Model Report (Komex, 2001a); and



- 
- Draft Groundwater Design Investigation Work Plan (Komex, 2002a).

### 3.1.2 DATA SCREENING

The scope of the human health risk assessment is to address the risks related to impacted groundwater at the Site. The concentrations of chemicals in groundwater have therefore been used as the primary source of data for assessing risk. Numerous soil samples have been collected at the Site prior to the soil remediation work to define the extent of soil impact. With soil remediation completed, these data are not relevant to the current Site conditions and consequently have not been used in the groundwater risk assessment. Limited surface water sampling has been conducted from the creek flowing to the southeast of the site. Groundwater from the site is interpreted to discharge to this creek (**Section 2.5**) and therefore these surface water data are considered relevant to the risk assessment, for comparison purposes only.

Remediation was conducted in 1999 and 2000 to remove impacted soils from the Site. This remediation work likely produced an improvement in groundwater quality. Analytical results of groundwater samples taken prior to this remediation are not considered representative of current groundwater quality at the Site. For this reason, these data have not been used for the assessment of risks.

The data considered relevant to the baseline human health risk assessment are the analytical results for organic chemicals from groundwater and surface water monitoring conducted at the Site since remediation was completed. These data are presented in **Tables 3-1 to 3-3**.

A total of 17 groundwater sampling events have been conducted at the Site since completion of the soil remediation, all of which have been carried out by Komex. These have occurred on an approximately quarterly basis since June 2000. Analysis of volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and PCBs has been routinely conducted on groundwater samples collected from the Site. **Table 3-1** presents the analytical results for organic chemicals in groundwater that have been detected above the method detection limit (MDL) on at least one occasion. Organic chemicals included in the groundwater analysis but not detected are presented in **Table 3-2**.

Surface water sampling of the small creek in the wetland area was conducted on one occasion from six points along the creek. These data are provided in **Table 3-3**.

A review of the reliability of these data is presented in the following sections.



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### 3.1.3 DATA VALIDATION

Data validation is an independent, systematic, after-the-fact process of evaluating data and comparing the results to pre-established criteria. For this risk assessment, specific quality control indicators associated with the data were reviewed to determine whether the stipulated data quality objectives had been met. The objectives address five principal parameters: precision, accuracy, completeness, comparability, and representativeness. To verify that the objectives were met, field measurements, sampling and handling procedures, laboratory analysis and reporting, and nonconformance and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures. The procedures and criteria for validation are defined in the RI/FS Data Validation Program Guidelines, which are based on the U.S. EPA National Functional Guidelines for Data Review (U.S. EPA, 1988a, 1988b).

The validation process culminates in the assignment of a qualifier flag for each analyte defining the confidence level in the data. The measured chemical concentrations obtained during the investigative sampling, and used in the risk assessment, will be validated. Data that do not adequately meet the criteria addressed during data validation will not be used in the quantitative risk assessment (U.S. EPA, 1988a, 1988b, 1992c).

The analytical results are determined to be relevant to the scope of this risk assessment. Each of the 17 rounds of sampling conducted in that period have been performed by Komex. These data have been evaluated to assess suitability of use in the risk assessment. The evaluation has been conducted in two parts: (1) evaluation of sample collection procedures, and (2) evaluation of analytical data.

#### 3.1.3.1 Evaluation of Sampling Procedures

The following documentation has been reviewed:

- Sampling protocols and quality assurance procedures;
- Groundwater monitoring reports;
- Field daily activity logs;
- Sample collection logs;
- Specific field forms for sample collection and handling;
- Chain-of-custody forms and requests for analysis;
- Field personnel training documents; and



- Variances, surveillance reports of field activities.

The 17 groundwater monitoring events conducted by Komex have an associated sampling and analysis plan and quality assurance project plan. The relevant documents for each monitoring event are listed in **Table A** below. These documents have been reviewed by the U.S. EPA and are considered suitable for the purposes of characterizing chemical concentrations in groundwater at the Site.

**Table A: Sampling and Analysis Protocols**

<b>Groundwater Monitoring Event</b>	<b>Protocol Documents</b>
June 2000 September 2000	Sampling and Analysis Plan (Komex, 1999a) Quality Assurance Project Plan (Komex, 1999b)
April 2001 July 2001 October 2001 January 2002 May 2002	Sampling and Analysis Plan (Komex, 2001b) Quality Assurance Project Plan (Komex, 2001c)
August 2002 October 2002 February 2003 May 2003	Revised Work Plan (Komex 2002b) Revised Sampling and Analysis Plan, (Komex, 2002c) Revised Quality Assurance Project Plan, (Komex, 2002d)



Groundwater Monitoring Event (Cont'd)	Protocol Documents (Cont'd)
August 2003 October 2003 February 2004 May 2004 August 2004 November 2004	Sampling and Analysis Plan (Komex, 2003d) Quality Assurance Project Plan (Komex, 2003e)

The sampling and analysis protocols have been reviewed for the purposes of the human health risk assessment. The protocols are largely the same for every sampling event and are considered suitable for providing data for the purposes of this risk assessment. Full details of the sampling protocols are presented in the documents referenced in **Table A**. A summary of the sampling protocol used by Komex at the Site is given below (Komex, 2001b, 2001c, 2003d).

- Wells to be sampled are purged using a bailer or submersible pump until hydro-geochemical parameters have stabilized within 10%, a maximum of three well casing volumes have been purged or until the well becomes dry. Samples are taken once water levels have recovered 80%, or a minimum of two hours after purging in the event of slow recovery. Field and trip blanks and a sample duplicate are taken.

Examination of sample reports and field records shows that the sampling protocols have been followed correctly. These protocols are appropriate for the purposes of data collection for this risk assessment.

### 3.1.3.2 Analytical Data

Samples from the 17 groundwater monitoring events conducted by Komex were analyzed by Analytical Environmental Services in Atlanta for the following suite of compounds:

- VOCs in accordance with EPA Method 8260B;
- SVOCs in accordance with EPA Method 8270B; and
- PCBs in accordance with EPA Method 8082 (unfiltered and filtered).

The following analysis was conducted on surface water samples taken from the creek:

- VOCs in accordance with EPA Method 8260B;
- SVOCs in accordance with EPA Method 8270B; and
- PCBs in accordance with EPA Method 8082.



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The analysis has been conducted in accordance with U.S. EPA methods and the Komex Laboratory Quality Management Plan (LQMP). The LQMP describes the data validation requirements that the laboratory must adopt. The laboratory is required to report any non-conformances that may affect the accuracy or precision of the data.

The following key analytical data have been reviewed:

- Sample analytical results;
- Holding times;
- Surrogate recoveries;
- Matrix spikes, matrix spike duplicates<sup>1</sup>;
- Blank evaluations;
- Internal standards;
- Instrument performance checks; and
- Initial and continuing calibrations.

Correspondence from the laboratory confirms that no significant problems were encountered during the laboratory analysis. A number of non-conformances were reported in the case narratives provided by the laboratory. Review of this correspondence indicates that the non-conformances were minor and that appropriate and timely action had been taken to rectify these. In summary, non-conformances generally comprised of documentation and sample labeling inconsistencies (6), analyte detected in method blanks (2), broken sample containers (8), hold times exceeded (14) and spike, surrogate, internal standard and/or laboratory control sample recoveries reported outside the acceptable limits (37). A list of non-conformances reported by the laboratory is provided in **Appendix A**.

Additional analysis was conducted by the U.S. EPA on selected samples taken in October 2002. Although this data cannot be fully validated, it has been included in the COPC selection basis as a conservative measure.

### 3.1.4 DATA USEABILITY SUMMARY

The analytical results for groundwater and surface water sampling are presented in **Tables 3-1 through 3-4**. Qualifiers have been assigned to data with quality control indicators below the acceptable performance criteria. All data not assigned qualifiers are of acceptable quality and

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<sup>1</sup> Site specific MS/MSD samples collected by Komex since 2002. Prior to 2002, all MS/MSD analysis was conducted internally by the laboratory



will be used during COPC selection. Estimated quantitative results, such as those identified by a "J" qualifier, will be incorporated in COPC selection (U.S. EPA, 1992c). The "J" qualifier describes an estimated value for a tentatively identified chemical or one that is present but whose value is less than the required quantitation limit. Analytical results that are at or below detection limits are qualified with a "U" and will also be used in the risk analysis (EPA split samples). The "B" qualifier indicates that the analyte was found in the associated blank as well as in the qualified sample. Only data with a "B" qualifier was included in the risk assessment if the concentration in the sample exceeded ten times the maximum amount detected in the blank. 51 sample results for bis(2-ethylhexyl) phthalate were assigned a "B" qualifier as bis(2-ethylhexyl) phthalate was also detected in field and/or equipment blanks for that sampling event. Two of the "B"-qualified bis(2-ethylhexyl) phthalate results were reported at ten times the maximum amount detected in the corresponding blank. Data found to be invalid was assigned an "X" qualifier and/or denoted in Table 3-1 with a "\*\*\*" and was not used in the quantitative risk assessment. A single sample (WSW-1) collected on October 23, 2001 was flagged "\*\*\*" because laboratory communication reports indicated that the result may have been attributed to laboratory cleaning agents. However, a corresponding laboratory blank sample was not available to confirm the reliability of the data and therefore, the data was included in the risk assessment.

A review of laboratory non-conformances (**Appendix A**) revealed a number of samples that exceeded holding times or reported spike recoveries outside acceptable limits (Section 3.1.3.2). Additionally, two sample results were assigned a "B" qualifier by the laboratory. However, although these non-conformances and data qualifiers may indicate some uncertainty (biased high or low) in the reported concentration of the chemical, it does not indicate uncertainty related to its assigned identity. Therefore, it was determined that these results were suitable for inclusion in the risk assessment. None of the data presented in **Tables 3-1 to 3-3** have an "X" qualifier, and therefore all the data in these tables are determined suitable for inclusion in the risk assessment, with the exception of the "B"-qualified data for bis(2-ethylhexyl) phthalate.

## 3.2 SELECTION OF COPC

COPC have been selected from all the compounds analyzed in groundwater samples from the Site. COPC have been selected by comparing the maximum concentrations in **Tables 3-1 and 3-2** with screening toxicity values. For compounds that have not been detected, the maximum MDL has been used as the screening concentration. The U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (U.S. EPA, 2004a) have been used as toxicity screening values, where



available. Note that for non-carcinogens, a value of one-tenth the PRG has been used to account for potential additivity of non-cancer health effects.

Details of the maximum concentrations, number of detections, and screening toxicity values are presented in **Tables 3-4 and 3-5**. Chemical analysis has been conducted for a total of 102 organic compounds. Twenty-nine organic compounds have been detected in groundwater samples collected from the Site. Of these, 17 had a maximum concentration in excess of the screening toxicity value and have been retained as COPC in the risk assessment (**Table 3-4**). A comparison of the MDLs with screening values was undertaken for the undetected organics. Of the undetected organics, 31 had a maximum MDL in excess of the screening toxicity value. These compounds have been retained as COPC in the risk assessment (**Table 3-5**). An additional four COPC, with no available screening toxicity values were conservatively retained as COPC but were not evaluated quantitatively in this risk assessment.

U.S. EPA Region 9 PRGs were not available for 11 of the undetected organic compounds. Therefore, where applicable, surrogate screening values were used. The PRG for naphthalene was applied as the surrogate screening value for 2-methylnaphthalene. The PRG for pyrene was applied as the screening value for acenaphthylene, benzo(g,h,i)perylene, and phenanthrene and the PRG for methyl-iso-butyl ketone was applied for methyl-n-butyl ketone. The remaining six chemicals: bis(2-Chloroethoxy) methane, 2-nitrophenol, 4-bromophenyl ether, 4-chlorophenyl phenyl ether, 4-nitrophenol and 4-chloro-3-methylphenol were not compared to any screening toxicity values. Four of these chemicals, bis(2-chloroethoxy) methane, methyl n-butyl ketone, 4-bromophenyl ether, 4-chlorophenyl phenyl ether and 4-chloro-3-methylphenol, have been retained as COPC. However, quantitative evaluation of these four chemicals is not possible due to lack of adequate toxicity data currently available. Therefore, they have not been included in the risk calculations presented herein

Two of the above chemicals, 2- and 4-nitrophenol were evaluated qualitatively and subsequently were not be retained COPC. Nitrophenols are closely related chemicals with similar chemical and physical properties. Other than acutely lethal doses in animals, the ATSDR Toxicological Profile for nitrophenols does not list any oral studies for these two chemicals and the lethal doses are several orders of magnitude greater than the concentration used for screening at this Site (ATSDR, 1990). Currently, the ATSDR has not derived an oral MRL for these chemicals. The EPA has released a draft Drinking Water and Health Advisory for 4-nitrophenol. The Health Advisories are 800 µg/L for one-day, and 60 µg/L for a lifetime. However, EPA's IRIS states that, "a risk assessment for this substance is under review by an EPA workgroup" (U.S.EPA, 2003a). The EPA Health Advisories serve as guidance for levels of



contaminants in drinking water which should not cause health effects for the specified time period. In consideration of this, based on the qualitative assessment, no adverse health effects are anticipated at this time given that these chemicals have not been detected in groundwater at the Site, and the concentrations used for screening (2-nitrophenol=1.36 µg/L and 4-nitrophenol=7.92 µg/L) are well below the EPA's draft lifetime health advisory of 60 µg/L. Based on the qualitative evaluation, neither chemical has been included as a COPC.

In summary, a total of 52 chemicals have been retained as COPC (**Table B**). Screening values were not available for 4 of these chemicals and although they have conservatively been retained as COPC, there is inadequate data available to evaluate the risk associated with these chemicals quantitatively. There were 50 compounds that had maximum reported concentrations and or maximum MDLs below screening values and are not considered further.

Inorganic compounds were investigated during the initial RI work in the late 1980s and early 1990s and it was determined that the inorganic concentrations at the Site did not indicate the presence of contamination associated with the operations of MEW. (EarthTech 1990, U.S.EPA 1990 ROD). Based on this evaluation and at the direction of the agency, inorganic compounds are not listed as COPCs.



**Table B: Chemicals of Potential Concern**

Detected Organics	Undetected Organics	
1,1-Dichloroethane	1,1,2,2-Tetrachloroethane	Benzo(k)fluoranthene
1,2,4-Trichlorobenzene	1,1,2-Trichloroethane	Bis(2-Chloroisopropyl) Ether
1,2-Dichloroethene Total	1,2-Dichloroethane	Carbon Tetrachloride
1,3-Dichlorobenzene	1,2-Dichloropropane	Chlorodibromomethane
1,4-Dichlorobenzene	2,4,6-Trichlorophenol	Dibenzo(a,h)Anthracene
2-Chlorophenol	2,4-Dinitrotoluene	Dibenzofuran
Aroclor-1260	2,6-Dinitrotoluene	Hexachloro-1,3-Butadiene
Benzene	3,3-Dichlorobenzidine	Hexachlorobenzene
Bis(2-Chloroethyl) Ether	4,6-Dinitro-2-Methyl Phenol	Indeno(1,2,3-cd)Pyrene
Bis(2-ethylhexyl)phthalate	Aroclor 1016	2-Methylnaphthalene
Bromodichloromethane	Aroclor-1221	Nitrobenzene
Chlorobenzene	Aroclor-1232	Pentachlorophenol
Chloroform	Aroclor-1242	Vinyl Chloride
Naphthalene	Aroclor-1248	Bis (2-Chloroethoxy) Methane *
N-Nitrosodi-n-propylamine	Aroclor-1254	4-Bromophenyl Phenyl Ether *
Tetrachloroethene	Benz(a)anthracene	4-Chlorophenyl Phenyl Ether *
Trichloroethene	Benzo(a)pyrene	4-Chloro-3-Methylphenol *
	Benzo(b)fluoranthene	

\* Quantitative evaluation of the risks associated with these chemicals is not possible due to the absence of available data. These chemicals have not been included in the risk calculations but are discussed further in the uncertainty analysis of the report.

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## 4 TOXICITY ASSESSMENT

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The objective of the toxicity assessment is to provide information on the toxic effects of exposure to chemicals. More specifically, this step of the risk assessment provides a quantitative estimate of the relationship between exposure and severity or probability of human biological effects for each COPC.

**Section 4.1** describes how toxicity values are established and used for non-carcinogenic COPC. **Section 4.2** presents a similar discussion of carcinogenic COPC. **Section 4.3** describes how dermal exposures are quantified. Finally, the toxicity of the identified COPC is discussed in **Section 4.4**.

Relevant carcinogenic and non-carcinogenic toxicity data have been obtained from the following sources (in descending order of preference):

- Tier 1: IRIS on-line database (U.S. EPA, 2003a);
- Tier 2: EPA Peer Reviewed Toxicity Values (PRTV);
- Tier 3: Health Effects Assessment Summary Tables (HEAST), draft IRIS assessments, Agency for Toxic Substances and Disease Registry (ATSDR) toxicity profiles, and California Environmental Protection Agency (Cal-EPA) values.

### 4.1 NONCARCINOGENIC CHEMICALS

For the non-carcinogenic effects of chemicals, U.S. EPA assumes a dose exists below which no adverse health effects will be seen (U.S. EPA, 1989a). Below this "threshold," it is believed exposure to a chemical can be tolerated without adverse effects, and the body burden is not increased. Toxic effects become manifest only when physiologic protective mechanisms are overcome by exposure doses above the threshold.

The reference dose (RfD), expressed in units of milligrams per kilogram body weight-day (mg/kg-d), represents the daily intake (averaged over a year) of a chemical per kilogram of body weight that is below the effect threshold for that chemical. In essence, the RfD represents the receptor-specific threshold dose. In addition, U.S. EPA assumes non-carcinogenic exposure doses are not cumulative from age group to age group over a lifetime of exposure (U.S. EPA, 1989a). An RfD is specific to the chemical, route of exposure, and duration over which the exposure occurs.



The U.S. EPA reviews all relevant human and animal studies for each chemical and selects the studies pertinent to the derivation of specific RfDs. Each study is evaluated to determine the no-observable-adverse-effect level (NOAEL) or, if data are inadequate for such a determination, the lowest-observable-adverse-effect level (LOAEL). The NOAEL corresponds to the dose (mg/kg-d) that can be administered over a lifetime without inducing observable adverse effects. The LOAEL corresponds to the lowest daily dose (mg/kg-d) that can be administered over a lifetime that induces an observable adverse effect. The toxic effect characterized by the LOAEL is referred to as the "critical effect."

To derive an RfD, the NOAEL (or LOAEL) is divided by uncertainty factors to ensure that the RfD will be protective of human health. Uncertainty factors are applied to account for:

1. Extrapolation of data from laboratory animals to humans (interspecies extrapolation);
2. Variation in human sensitivity to the toxic effects of a chemical (intraspecies differences);
3. Derivation of a chronic RfD based on a subchronic rather than a chronic study; and
4. Derivation of an RfD from the LOAEL rather than the NOAEL.

Each of these uncertainties usually represents a factor of 10. In addition to these uncertainty factors, modifying factors between 0 and 10 may be applied to reflect additional qualitative considerations in evaluating the data (U.S. EPA, 1989a).

The toxicological data for inhalation exposure is often presented as a reference concentration (RfC) and has units of milligrams per cubic meter (mg/m<sup>3</sup>). In essence, the RfC represents the receptor-specific threshold concentration for the COPC in air. Below this concentration, no adverse effect is expected to occur. The following equation has been used to convert reference concentrations to reference doses:

$$RfD_{inh} = \frac{RfC * IR}{BW} \dots\dots\dots (4-1)$$

where,

RfD<sub>inh</sub> = reference dose for inhalation (mg/kg-d)

RfC = reference concentration (mg/m<sup>3</sup>)

IR = inhalation rate (assumed to be 20 m<sup>3</sup>/d)

BW = body weight (assumed to be 70 kg)

The non-carcinogenic risk associated with a chemical exposure is expressed as the hazard quotient (HQ). The HQ is a ratio of the estimated chemical intake, based on the measured or

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calculated exposure concentration for a chemical (dose), divided by the appropriate oral or inhalation RfD. If the HQ exceeds 1, some harmful effect may occur or the threshold dose may be exceeded. If the HQ is equal to or less than 1, the exposure level is not likely to cause adverse effects. If exposure to multiple chemicals occurs, the potential for harmful effects is assessed by summing the HQs and is designated as the hazard index (HI).

In keeping with U.S. EPA guidance (1989a), all non-carcinogenic risk will be considered additive for individual receptors. Since the non-carcinogenic COPC under investigation at the Site are associated with various adverse effects on distinct target organs and systems, the assumption of additivity of effects may overstate the potential for harmful effects. On the other hand, the potential synergistic effects of two or more COPC must also be recognized. That is, the combined effects of exposure to two COPC may be worse than exposure to either COPC alone because of interactions.

## 4.2 CARCINOGENIC CHEMICALS

The incremental lifetime cancer risk (ILCR) from a carcinogen is calculated as a product of the reasonable maximum daily intake (mg/kg-d) and the cancer slope factor (CSF). U.S. EPA's model of carcinogenesis assumes the relationship between exposure to a carcinogen and cancer risk is linear over the entire dose range, except at very high doses (U.S. EPA, 1989a). This linearity assumes that there is no threshold-of-exposure dose below which harmful effects will not occur. Because of this, carcinogenic effects are considered to be cumulative across age groups when considering lifetime exposures.

CSFs are upper-bound (95 percent upper confidence limit [UCL]) estimates of the increased cancer risk per unit dose, in which risk is expressed as the probability that an individual will develop cancer within his or her lifetime as the result of exposure to a given level of a carcinogen. All cancers or tumors are considered whether or not death occurs as a result. This approach is inherently conservative because of the no-threshold assumption and the use of the 95 percent UCL of the estimated slope of dose versus cancer risk.

In addition to the CSF, the toxicity information considered in the assessment of potential carcinogenic risks includes a weight-of-evidence classification. The U.S. EPA groups chemicals according to their potential for carcinogenic effects based on clinical evidence (U.S. EPA, 1989a):

- Group A Human carcinogen
- Group B Probable human carcinogen
- Group C Possible human carcinogen



- Group D Insufficient data to classify as a human carcinogen
- Group E Not a human carcinogen

The primary source for toxicological reference values is the IRIS (U.S. EPA, 2000).

### 4.3 QUANTIFICATION OF DERMAL EXPOSURE RISKS

Dermal RfDs and CSFs are traditionally derived from the corresponding oral values (U.S. EPA, 2004b) using the following equation:

$$SF_{der} = \frac{SF_o}{ABS_{GI}} \dots\dots\dots (4-2)$$

$$RfD_{der} = RfD_o * ABS_{GI} \dots\dots\dots (4-3)$$

where,

$Sf_{der}$  = dermal slope factor (mg/kg-d)<sup>-1</sup>

$Sf_o$  = oral slope factor (mg/kg-d)<sup>-1</sup>

$ABS_{GI}$  = fraction of chemical absorbed in the gastrointestinal tract (dimensionless)

$RfD_{der}$  = dermal reference dose (mg/kg-d)

$RfD_o$  = oral reference dose (mg/kg-d)

The U.S. EPA RAGS E document (U.S. EPA, 2004b) has been used to determine the fraction of chemical absorbed in the gastrointestinal tract for each COPC. These values are presented in **Table 4-1**.

### 4.4 TOXICITY OF IDENTIFIED COPC

Toxicity profiles for the 52 COPC are presented in **Appendix B**. Toxicity data for the 48 COPC with available toxicity data are listed in **Tables 4-1** through **4-4**. Thirty-seven COPC have a carcinogenic group rating of C (possible human carcinogen) or above. Trichloroethene (TCE) has not been given a carcinogenic group rating. However, according to the "Guidelines for Carcinogen Risk Assessment (Draft)" (U.S. EPA, 1999), TCE is characterized as highly likely to produce cancer in humans. The COPC considered carcinogens for this risk assessment are listed in **Table C**.

The U.S. EPA has assigned seven compounds a carcinogenic group rating of D for both inhalation and ingestion pathways; that is, there is insufficient data to classify these compounds

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as carcinogens. No classification is given by the U.S. EPA for the carcinogenicity of five compounds. For the purposes of this risk assessment, these compounds are considered non-carcinogens. The COPC considered non-carcinogens for this risk assessment are listed in **Table C**.

All COPC are considered to have non-carcinogenic effects, and therefore oral, dermal, and inhalation reference doses have been derived for all 48 compounds, where data are available. These values have been derived using the hierarchy given above and are presented in **Tables 4-1** and **4-2**. There is insufficient human or animal data to derive an oral reference dose for 13 chemicals and/or an inhalation reference dose for 37 chemicals. Note that in order to maintain a conservative approach to the assessment, the oral reference dose for *cis* 1,2-dichloroethene has been used to represent total 1,2-dichloroethene.

Oral, dermal, and/or inhalation cancer slope factors have been derived for the 37 carcinogenic COPC using the hierarchy of sources given above. These values are presented in **Tables 4-3** and **4-4**. There is insufficient human or animal data to derive an oral slope factor for three compounds: naphthalene, chloroform, and 1,1-dichloroethane. Likewise, there is insufficient data to derive an inhalation slope factor for 10 compounds as shown on **Table 4-4**.

The U.S. EPA recommends using a range of cancer slope factors for assessing risks from TCE (U.S. EPA, 2001b). Three slope factors are quoted in **Tables 4-3** and **4-4**: the National Center for Environmental Assessment original provisional value ( $0.006 \text{ mg}^{-1}.\text{kg}.\text{d}$ ; U.S. EPA, 1987), and the range of values quoted in the U.S. EPA's draft values for external review ( $0.02$  to  $0.4 \text{ mg}^{-1}.\text{kg}.\text{d}$ ; U.S. EPA, 2001b).



**Table C: Carcinogenic and Non-Carcinogenic COPC**

<b>Carcinogens</b>			
<b>Chemical</b>	<b>Classification</b>	<b>Chemical</b>	<b>Classification</b>
Tetrachloroethene	C -B2 Continuum	Aroclor-1254	B2
Trichloroethene	C -B2 Continuum	Aroclor-1260	B2
1,1,2,2-Tetrachloroethane	C	Benz(a)anthracene	B2
1,1,2-Trichloroethane	C	Benzo(a)pyrene	B2
1,1-Dichloroethane	C	Benzo(b)fluoranthene	B2
1,4-Dichlorobenzene	C	Benzo(k)fluoranthene ***	B2
Chlorodibromomethane	C	Bis (2-ethylhexyl) phthalate	B2
Hexachloro-1,3-Butadiene	C	bis(2-Chloroethyl) Ether	B2
Naphthalene	C	Bromodichloromethane	B2
1,2-Dichloroethane	B2	Carbon Tetrachloride	B2
1,2-Dichloropropane	B2	Chloroform	B2
2,4,6-Trichlorophenol	B2	Dibenzo(a,h)Anthracene ***	B2
2,4-Dinitrotoluene	B2	Hexachlorobenzene	B2
2,6-Dinitrotoluene	B2	Indeno(1,2,3-cd)Pyrene ***	B2
3,3-Dichlorobenzidine	B2	Nitrosodi-n-propylamine	B2
Aroclor-1221	B2	Pentachlorophenol	B2
Aroclor-1232	B2	Benzene	A
Aroclor-1242	B2	Vinyl Chloride	A
Aroclor-1248	B2		
<b>Non-Carcinogens</b>			
<b>Chemical</b>	<b>Classification</b>	<b>Chemical</b>	<b>Classification</b>
2-Chlorophenol	Not Known	1,2-dichloroethene (cis)	D
4,6-Dinitro-2-Methyl Phenol	Not Known	1,2-dichloroethene (trans)	D
Aroclor-1016	Not Known	1,2,4-trichlorobenzene	D
bis(2-Chloroisopropyl) Ether	Not Known	1,3-Dichlorobenzene	D
Methylnaphthalene	Not Known	Chlorobenzene	D
Trichloroethene	Highly Likely	Dibenzofuran	D
Trichloroethene <sup>1</sup>	Highly Likely	Nitrobenzene	D



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## 5 CONCEPTUAL EXPOSURE MODEL

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The conceptual exposure model (CEM) provides the basis for a comprehensive evaluation of the risks to human health by identifying the mechanisms through which receptors may be exposed to residual COPC. The CEM traces the COPC in a logical flow from their sources through release mechanisms and exposure routes to the potentially affected receptors.

Of particular importance, the CEM identifies which exposure routes are complete and significant under the given land use. These significant pathways are used in the quantitative risk assessment for each receptor. The CEM also facilitates the analysis and screening of exposure pathways likely to pose only minor risks.

This section presents the CEM developed for the quantification of potential future risks associated with impacted groundwater at the MEW Site. **Section 5.1** discusses the future land use of the Site and the possible receptor population. **Section 5.2** discusses the use of “reasonable maximum exposure” for assessing risks. **Section 5.3** presents the CEM.

### 5.1 FUTURE LAND USE AND ASSOCIATED RECEPTOR POPULATION

The MEW Property is situated in a predominantly commercial area next to a wetland. The Cape Girardeau City Plan shows that the MEW Property has an “M2” building zone classification, indicating that only heavy industrialized uses are currently permitted (current zoning for the City of Cape Girardeau; Brown, 2003). The adjoining wetland area has an “M1” building zone classification, indicating that only light industrial uses are currently permitted in this area. Under this zone classification, dwellings are permitted only if a special use permit is granted.

Deed restrictions will be employed at the Property to ensure that future land use on Site remains industrial or commercial and that groundwater beneath the Site cannot be used. For the purposes of the risk assessment, future land use is assumed to be commercial for the MEW Property.

Development constraints associated with the wetland are likely to mean that the future use of this area will remain unchanged; however, to ensure that the assessment of risks is conservative, the assumption is made that construction of buildings could occur on this land. Allowance is made for a special permit being granted that could allow a residential property to



be constructed on this land. For the purposes of this risk assessment, a potential future use for off-Site areas is assumed to be residential.

Given the potential future land uses described above, four receptor populations will be considered: the on-Site adult worker, the off-Site adult construction worker, the off-Site child resident (between the ages of 0 and 6 years), and the off-Site adult resident.

Consideration is also given to trespassers who could be exposed to potentially impacted water in the creek. As a conservative measure, the off-Site trespasser is assumed to be the same receptor as the off-Site resident and, for this reason, these two receptor populations are considered one.

Child receptors are assumed to be in residence at the Site for six years. Adult residents are assumed to be in residence for 30 years and on-Site workers for 25 years. Construction workers are assumed to be on-Site for one year. Risks will be assessed to adult workers on the MEW Property, potential off-Site construction workers, and residents off-Site.

## **5.2 REASONABLE MAXIMUM EXPOSURE**

U.S. EPA (1989a) recommends the use of reasonable maximum exposure (RME) to express the highest exposure that could reasonably occur at the Site. As a conservative estimate, the RME is within the range of possible exposures but higher than the typical or average exposure. RMEs are estimated for individual pathways. If a population is exposed to more than one pathway, the sum of the exposures across pathways also represents the RME (U.S. EPA, 1989a).

Populations potentially affected by Site COPC include people of various ages and lifestyles who live or conduct business at or near the Site. Instead of estimating health impacts to a specific individual, risk assessments focus on potential health effects to representative receptor groups. Each receptor evaluated in this work plan has been developed to conservatively represent the upper-bound exposures to a group of people that have similar lifestyles or perform similar daily activities. If the resultant risk to the selected receptor is determined to be acceptable, then it is likely that all other receptors within the group with lesser exposures will also be acceptable.

## **5.3 IDENTIFICATION OF COMPLETE EXPOSURE PATHWAYS**

Four elements must be present for an exposure pathway to be deemed complete:

1. COPC source;
2. Release mechanism;



3. Exposure pathway; and
4. Receptor.

### 5.3.1 COPC SOURCES

Discussion of COPC sources provides a starting point for the development of the exposure pathways. The primary original source of organic COPC is believed to be a small ditch with no apparent off-Site outlet that was approximately orientated from the northeast of MW-14 to the southeast of the MW-3, MW-11, and MW-11A cluster of wells. This ditch was removed during soil remediation.

Remediation conducted in 1999 and 2000 removed impacted material down to a maximum depth of 27 feet (8.2 m) bgs. Soils were remediated to a concentration of 10 ppm PCBs at the surface and with depth.

Groundwater analytical results show that the groundwater at the Site was impacted with chlorinated hydrocarbons (chlorobenzenes, chloroalkanes, and chloroalkenes), benzene, and PCBs. The highest concentrations of chlorobenzenes and benzene have been found in wells located in the southeastern corner of the Site, where concentrations of up to 3,200 micrograms per liter ( $\mu\text{g/L}$ ) chlorobenzene, 120  $\mu\text{g/L}$  dichlorobenzene, and 83  $\mu\text{g/L}$  benzene have been detected. Chloroalkanes and chloroalkenes have been detected in the highest concentrations in the central portion of the Site, where concentrations of up to 31  $\mu\text{g/L}$  have been detected (1,1 dichloroethane).

PCB Aroclor 1260 has been detected in monitoring wells in the southeast corner of the Site, up to a concentration of 110  $\mu\text{g/L}$  in unfiltered samples. Concentrations of PCBs in filtered groundwater samples (dissolved phase PCBs) have only been detected in one well (MW-11, up to 4.5  $\mu\text{g/L}$  Aroclor 1260). PCBs in filtered samples have not been detected in this well in the last 17 monitoring events.

Bis (2-ethylhexyl) phthalate has been detected sporadically within wells on the MEW Property and in wells in the wetland area. The highest concentrations have been detected in wells MW-11A and WSW-1 which are screened within the deep bedrock zone, where up to 120  $\mu\text{g/L}$  have been detected. This compound has also been detected in a number of field and equipment blanks and it is considered likely that the presence of this compound in groundwater samples is due to the use of plastic materials used for sampling and not as a result of the previous land-use on the MEW Property. As discussed in **Section 3.2**, this chemical has been retained as a COPC to maintain a conservative approach to the risk assessment.



### 5.3.2 RELEASE MECHANISMS

The release mechanism for COPC sorbed to soil entering groundwater is leaching. The leaching of chemicals from the soil sorbed phase to the dissolved phase is a function of the properties of the soil and the chemical. For organic compounds, the solubility and organic carbon partition coefficient ( $K_{oc}$ ) of the chemical and the fraction of organic carbon of the soil ( $f_{oc}$ ) affect the leaching potential.

In the vadose zone, leaching occurs by the infiltration of precipitation through the soil source zone, which carries chemicals in the dissolved phase to the groundwater table. Below the water table, chemicals will leach directly from contaminated soil into groundwater.

### 5.3.3 SIGNIFICANT EXPOSURE PATHWAYS

This section discusses the significance of each exposure pathway considered at the onset of the risk assessment and gives the rationale for the inclusion or exclusion of each in the final determination of risk. **Figure 5-1** summarizes the identified significant pathways at the Site and their relationships to the previously discussed COPC sources.

#### 5.3.3.1 Ingestion Exposure Pathways

These exposure pathways include the most likely routes by which a receptor may ingest COPC originating from the Site. The following ingestion exposure pathways relevant to groundwater sources were reviewed for inclusion in the risk assessment:

- Ingestion of groundwater from water supply;
- Incidental ingestion of groundwater in the wetland area; and
- Incidental ingestion of groundwater discharging to surface water.

The properties in the vicinity of the Site are currently supplied with water from the Cape Girardeau Municipal Supply. There are currently no wells used for water supply at or near the Site. As discussed in **Section 5.1**, future use of groundwater at the MEW Property will not be permitted by way of a deed restriction. The ingestion of groundwater from water supply will therefore not be evaluated further for on-Site receptors.

The future use of off-Site groundwater for domestic supply is considered possible though unlikely. The ingestion of groundwater from water supply will therefore be further evaluated for off-Site receptors.

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Groundwater from the Site is migrating southeast from the Property toward the wetland area and is likely discharging to the creek (**Section 2.5**). The incidental ingestion of groundwater discharging to the creek is therefore considered a potential pathway for off-Site receptors. Likewise, the incidental ingestion of groundwater in the wetland area is also considered a potential pathway for the off-Site construction worker.

The use of groundwater for irrigation or as drinking water for animals could present a risk to humans via the ingestion of animal or arable produce. As discussed in **Section 5.1**, the adjoining wetland area has an "M1" building zone classification, indicating that only light industrial uses are currently permitted in this area. The use of groundwater in the wetland area for irrigation or drinking water for animals is therefore not considered likely, and these pathways have not been considered further.

### **5.3.3.2 Inhalation Exposure Pathways**

Exposures via the inhalation pathways consist of COPC transported by air eventually reaching a receptor who inhales airborne vapor, gases, and/or suspended particulate. The following inhalation pathways relevant to groundwater sources were reviewed for inclusion in the risk assessment:

- Inhalation of soil vapor that migrates to indoor air; and
- Vapor inhalation from tap water.

Both pathways will be evaluated further in the risk assessment; however, as discussed in **Section 5.1**, the extraction of groundwater from the MEW Property will not be permitted, and therefore the vapor-inhalation-from-tap-water pathway will only be considered for off-Site receptors.

The inhalation of soil vapor that migrates to outdoor air pathway will not be evaluated further in the risk assessment. Exposure from this pathway is unlikely to be significant relative to that from the inhalation of indoor air. This is because any subsurface chemicals that volatilize and migrate into the outdoor air will be significantly diluted with atmospheric air.

### **5.3.3.3 Dermal Contact Exposure Pathways**

This group of pathways encompasses receptor activities that result in direct contact with groundwater containing COPC. The following dermal contact exposure pathways relevant to groundwater sources were reviewed for inclusion in the risk assessment:

- Dermal contact with groundwater discharging to surface water;



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- Dermal contact with groundwater in the wetland area; and
  - Dermal contact with groundwater extracted for domestic supply.

These pathways will be evaluated further in the risk assessment; however, as discussed in **Section 5.1**, the extraction of groundwater from the MEW Property will not be permitted, and therefore the dermal-contact-with-tap-water pathway will only be considered for off-Site receptors.

Dermal contact with groundwater in the wetland area will only be evaluated for the off-Site construction worker receptor.

### **5.3.4 POTENTIALLY EXPOSED POPULATIONS**

Persons who work at or live near the Site are the most likely to be exposed to its residual COPC. To provide worst-case risk estimates for planning and comparison purposes, the risk assessment will evaluate the potential health effects to four future RME receptors: the on-Site adult worker, the off-Site adult construction worker, the off-Site child resident, and the off-Site adult resident.

It is important to note if the associated risks to the proposed future receptors are acceptable, then other, lesser exposures such as current Site use (e.g. commercial worker on Site or trespasser) are also acceptable. Receptors were chosen to ensure that the estimated risk values protect human health and that the actual risks do not exceed the predicted values. The development and selection of these receptors was based on the RME concept discussed in **Section 5.2** and regulatory guidance.

Descriptions of the types, locations, and lifestyles of these populations are provided below.

#### **5.3.4.1 Off-Site Child Residential Exposure**

The hypothetical residential receptor represents a conservative worst-case future land use. The child is assumed to be at the off-Site property south of the MEW Site for 24 hours a day, 7 days a week, 350 days per year, for the first 6 years of their life. Six significant exposure pathways are applicable to this receptor:

- Inhalation of COPC that have volatilized from groundwater and have migrated from the subsurface through the floor of the house;
- Inhalation of volatilized COPC from tap water obtained from a domestic water supply well;
- Ingestion of tap water obtained from a domestic water supply well;



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- Dermal contact with tap water obtained from a domestic water supply well;
  - Incidental ingestion of groundwater (that has discharged to surface water); and
  - Dermal contact with groundwater (that has discharged to surface water).

#### **5.3.4.2 Off-Site Adult Residential Exposure**

The hypothetical residential receptor represents a conservative worst-case future land use. The adult is assumed to be at the off-Site property south of the MEW Site for 24 hours a day, 7 days a week, 350 days per year, for 24 years of their life. Six significant exposure pathways are applicable to this receptor:

- Inhalation of COPC that have volatilized from groundwater and have migrated from the subsurface through the floor of the house Inhalation of volatilized COPC from tap water obtained from a domestic water supply well;
- Ingestion of tap water obtained from a domestic water supply well;
- Dermal contact with tap water obtained from a domestic water supply well;
- Incidental ingestion of groundwater (that has discharged to surface water); and
- Dermal contact with groundwater (that has discharged to surface water).

#### **5.3.4.3 On-Site Adult Worker Exposure**

The hypothetical commercial receptor represents a conservative worst-case future land use for the MEW Property. The adult worker receptors are assumed to work at the property where the Site is currently located for a period of 25 years of their lifetime and to be directly exposed to chemicals in groundwater indirectly via inhalation of VOC vapors that have migrated from the underlying groundwater into the ambient/indoor air.

The worker is assumed to be at the Site for 10 hours a days, 5 days a week, 250 days per year, for 25 years. One significant exposure pathways is applicable to this receptor:

- Inhalation of COPC that have volatilized from groundwater and have migrated from the subsurface through the floor of the building.

#### **5.3.4.4 Off-Site Adult Construction Worker Exposure**

The hypothetical construction worker receptor represents a conservative worst-case scenario for future construction workers involved with excavations in the wetland area. The construction worker receptor is assumed to be directly exposed to chemicals in groundwater via dermal contact and incidental ingestion while working in/with excavations. The construction worker is



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assumed to be at the Site for 12 hours a day, 250 days per year, for 1 year. Two significant exposure pathways are applicable to this receptor:

- Incidental ingestion of groundwater that has entered the excavation in the wetland area; and
- Dermal contact with groundwater that has entered the excavation in the wetland area.

MEW Site File  
3DISC100055



## 6 EXPOSURE POINT CONCENTRATIONS

To quantify exposures, statistically representative concentrations must be estimated for COPC in the impacted environmental media that is in direct contact with the receptor. The point of contact with impacted environmental media is termed the “point of exposure (POE).” The CEM has identified a number of potential points of exposure. These are:

- Indoor air in a potential future commercial building located on the Property;
- Indoor air in a potential residential building located off Site to the southeast of the Property;
- Tap water sourced from a potential future well located off-Site to the southeast of the Property;
- Groundwater that has entered an excavation in the wetland area; and
- Surface water in the creek that crosses the wetland area to the southeast of the Site.

COPC concentrations for the tap water POE will largely depend on the location of any future well. Wells located close-to and directly down hydraulic gradient from the COPC source area are likely to have higher concentrations than those located further from the Site. In recognition of this fact, the risk to future residential receptors has been assessed for three different hypothetical well locations. The locations of these wells have been chosen using the predicted COPC plume maps from the groundwater modeling (**Appendix C**; Komex, 2005f):

- Hypothetical Well A: This well is located on the eastern side of the Morrill Property, close to the now-abandoned well MW-8. This well is directly down hydraulic gradient of the source area and is situated centrally within the modeled COPC plume;
- Hypothetical Well B: This well is located directly down hydraulic gradient from the Site next to Wilson Road and is situated centrally within the modeled COPC plume; and
- Hypothetical Well C: This well is located to the east of the existing monitoring wells MW-17A and MW-17B.

The locations of Hypothetical Wells A and B have been chosen such that they represent worst-case off-Site concentrations. Two wells are required to do this because the source areas differ between COPC. Hypothetical Well A represents worst-case concentrations for the majority of COPC. For the remaining COPC, worst-case concentrations occur in Hypothetical Well B. The location of Hypothetical Well C has been chosen such that it lies outside the modeled organic COPC plume. The locations of the hypothetical wells are shown on **Figure 6-1**.

MEW Site File  
3DISC100056



Given that the maximum concentrations of COPC do not always occur at the same Hypothetical Well location a fourth scenario has been created; Hypothetical Well D. This scenario uses the maximum predicted concentration from Hypothetical Wells A and B for each COPC and represents worst-case conditions for all COPC. It should be noted that due to the fact that not all COPC have the same source area, it is highly unlikely that this scenario could occur. However, it has been included in the risk assessment as a conservative measure.

The points of exposure listed above are characterized as indirect, meaning exposures occur away from or in a different medium than the source. POE concentrations have been estimated from measured data or from fate and transport modeling. Fate and transport modeling has been used to estimate POE concentrations where measured data is either unavailable or considered insufficiently conservative.

Groundwater fate and transport modeling has been used to predict the exposure point concentrations of organic COPC in groundwater in the wetland areas, surface water within the wetland creek and within tap water from the Hypothetical Wells.

The results of the groundwater modeling have been used for estimating POE concentrations for organic COPC for the following reasons:

1. The concentrations of organic COPC in off-Site wells may not be representative of actual COPC concentrations in the groundwater off-Site. As indicated by the fracture network modeling (**Appendix C**), there remains the possibility that elevated concentrations of COPC could exist within fractures that have not been intercepted by the monitoring wells in the wetland area. The results of the groundwater modeling predict higher concentrations in the wetland area than those measured within off-Site wells for all organic COPC. For this reason, the use of the groundwater modeling results, as opposed to measured concentrations in the wetland area is considered more conservative. For example, the highest concentrations of TCE and chlorobenzene measured in groundwater in the wetland area since 2000, have been reported at 9.9 µg/L and 2.9 µg/L, respectively. The maximum simulated RME concentrations for hypothetical wells A and B are 15.25 µg/L for TCE and 2,901 µg/L for chlorobenzene.
2. Only one set of surface water samples has been collected from the creek (**Table 3-3**). No COPC were detected in these samples with the exception of bis (2-ethylhexyl) phthalate (up to 8.8 µg/L) which was detected at a higher concentration (up to 28 µg/L) in an equipment blank analyzed during the same sampling event. However, this data set is considered insufficient to estimate statistically representative COPC concentrations at this POE. The



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results of the groundwater modeling are considered to provide a conservative estimate of possible concentrations of COPC at this POE.

Direct measurement of indoor air concentrations is not possible for future scenarios and therefore vapor transport modeling has been used to predict COPC POE concentrations for the inhalation of indoor air. The Johnson-Ettinger model (U.S. EPA, 2003c) has been used to predict potential future indoor air concentrations on and off the MEW Property arising from impacted groundwater.

Groundwater source concentrations are required for use in the Johnson-Ettinger model. The measured groundwater concentrations on-Site have been used to calculate 95 percent UCL values which were subsequently used as source concentrations for the prediction of indoor air concentrations in future buildings on the MEW Property. For future off-Site buildings on the wetland area, the predicted concentrations of COPC in shallow groundwater in the wetland area have been used for the Johnson-Ettinger modeling. As discussed above, the results of the groundwater modeling provide a more conservative estimate of groundwater concentrations in the wetland area than those measured. For this reason, the concentrations in the wetland area predicted by the groundwater model have been used as the source concentrations for the off-Site Johnson-Ettinger modeling.

**Section 6.1** discusses the statistical methods used in the evaluation of groundwater analytical data for estimating statistically representative groundwater source concentrations for use in the on-Site Johnson-Ettinger model. **Section 6.2** presents the fate and transport methodologies used for predicting POE concentrations from indirect exposures. A summary of the POE concentrations used for the risk assessment is given in **Section 6.3**.

## **6.1 STATISTICAL EVALUATION OF ANALYTICAL DATA**

Statistical methods have been used to evaluate the numerous analytical results from the Site groundwater sampling to: 1) characterize the statistical distribution of COPC, and 2) develop source-term concentrations for fate and transport modeling. The rationale used to develop this methodology and the statistical techniques are based on the following sources:

- RAGS, Volume I - Human Health Evaluation Manual, Part A (U.S. EPA, 1989a);
- Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 1 (U.S. EPA, 1989b);
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (U.S. EPA, 2002c);



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- Statistical Methods for Environmental Pollution Monitoring (Gilbert, 1987); and
  - Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities (U.S. EPA, 1989c).

### 6.1.1 SELECTION OF REPRESENTATIVE DATA

The concentrations of COPC detected in wells on the MEW Property vary temporally and spatially across the Site. To allow RME to be quantified (**Section 5.2**), reasonable maximum concentrations of COPC must be estimated. For this reason, the statistical analysis has been performed on the groundwater analytical data from wells where the maximum concentrations of COPC have been detected.

Examination of the groundwater analytical data (**Table 3-1**) shows that the maximum concentrations of the chlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-chlorophenol, N-nitrosodi-n-propylamine, and benzene have consistently been detected in well MW-12. The data from this well have been used to estimate reasonable maximum source concentrations for these compounds.

The compound 1,2,4-trichlorobenzene has been detected at similar concentrations in wells MW-4, MW-7, MW-10 and MW-12. The data from these wells have been used to estimate reasonable maximum source concentration for this compound.

The maximum concentrations of TCE in groundwater on the MEW Property have consistently been detected in well MW-10. The data from this well have been used to estimate reasonable maximum source concentrations for TCE on the MEW Property.

The maximum concentrations of total 1,2-dichloroethene in groundwater on the MEW Property have consistently been detected in well MW-11. The data from this well have been used to estimate reasonable maximum source concentrations for this compound on the MEW Property. The maximum concentrations of PCE have consistently been detected in well MW-4. The data from this well have been used to estimate reasonable maximum source concentrations for PCE.

The maximum concentrations of bis (2-ethylhexyl) phthalate have consistently been detected in well MW-11A. The data from this well have been used to estimate reasonable maximum source concentration for this compound.

The maximum concentrations of PCB Aroclor 1260 in unfiltered samples have been detected in wells MW-5 and MW-11. The data from these wells have been used to estimate reasonable maximum source concentration for this compound. The maximum concentrations of PCB



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Aroclor 1260 in filtered samples have been detected in well MW-11. The data from this well has been used to estimate reasonable maximum source concentration for this compound.

The only detectable concentration of Bis (2-chloroethyl) ether on-Site was detected in well MW-4. The data from this well have been used to estimate the reasonable maximum source concentration for this compound.

The only detectable concentration of naphthalene on-Site was detected in well MW-3. The data from this well have been used to estimate the reasonable maximum source concentration for this compound.

The only detectable concentrations of chloroform on-Site have been detected in well WSW-1. The data from this well have been used to estimate the reasonable maximum source concentration for this compound.

The compound 1,1-dichloroethane has been detected at similar concentrations in wells MW-4 and MW-10. The data from these wells have been used to estimate the reasonable maximum source concentration for this compound.

Note that 35 of the organic COPC have not been detected in any monitoring well. For the 31 compounds that are being quantitatively evaluated, they have been retained as COPC because the maximum MDL is in excess of the risk screening value (**Section 3.2**). For compounds that have not been detected, one-half of the maximum MDL has been used as the source concentration.

For each groundwater COPC that has been detected on-Site, statistical summaries have been developed using the U.S. EPA software ProUCL. These summaries include the arithmetic mean, minimum measured concentration, maximum measured concentration, standard deviation, and 95 percent UCL of the mean. Statistical summaries are presented in **Table 6-1**, and the process used to derive them is described below. Full statistical outputs from the ProUCL analysis are provided in **Appendix D**.

### **6.1.2 DETERMINATION OF DATA DISTRIBUTION**

Fundamental to the statistical analysis is establishing the data set distribution. The distribution must be determined prior to the application of any statistical methods. This minimizes the effect of data biasing.



Figure 6-2 shows time series plots of detected organic COPC concentrations in the wells where the maximum concentrations have been detected. Temporal variation is observed, but the long-term trend appears to be stable for most COPC.

The U.S. EPA software ProUCL has been used to assess the distribution type of the source concentrations for each detected organic COPC. The data selected for analysis were chosen to represent source concentrations. For detected organic compounds the data from wells where the highest concentrations were detected were selected for analysis (Section 6.1.1).

The data sets used to conduct the statistical analysis contain numerous duplicate samples. Where duplicates have been taken, the highest concentration between the duplicate and its pair has been used to represent that sampling event. This avoids the statistical analysis being skewed due to duplicate samples. For the one sampling event, October 2002, in which the U.S. EPA provided split sample results the data were treated in accordance with the treatment of duplicate samples described above.

The results of this statistical analysis show that the source concentrations of benzene, chlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, naphthalene, 2-chlorophenol, 1,1-dichloroethane, PCE and TCE are normally distributed. The remaining source concentrations are not normally distributed. The source concentrations of 1,2,4-trichlorobenzene, 1,2-dichloroethene, chloroform, n-nitrosodi-n-propylamine, bis(2-chloroethyl) ether, and Aroclor 1260 (filtered) are distributed non-parametrically and the source concentrations of bis(2-ethylhexyl) phthalate and Aroclor 1260 (unfiltered) represent gamma distributions.

### 6.1.3 TREATMENT OF COPC "NON-DETECTS"

Every analytical technique used to measure the concentration of chemicals has an associated limit of detection (LOD) and limit of quantitation (LOQ). A chemical that is not detected in a sample is below the LOD. A chemical that is detected but in such low amounts that its concentration could not be accurately determined is below the LOQ. When a chemical is reported as not detected in a sample, the actual concentration is any value up to the LOD.

For the risk assessment, when a COPC is detected sporadically in a well, it will be assumed to exist in samples from that well in which it was not detected. The assignment of a value of one-half the detection limit to all samples reported as not detected reflects the assumption that the samples are equally likely to have any value up to the detection limit (U.S. EPA, 1988a, 1988b).



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#### 6.1.4 USE OF 95 PERCENT UPPER CONFIDENCE LIMIT CONCENTRATIONS

Due to the uncertainty associated with characterizing potentially heterogeneous media, the 95 percent UCL must be used to represent chemical concentrations (U.S. EPA, 1988a, 1988b). The U.S. EPA software has been used to estimate the 95 percent UCL concentration for each detected COPC. This software provides the 95 percent UCL for different data distribution types and recommends the most appropriate value to use for representing the data. The values recommended by the software have been selected for use in the risk assessment.

As discussed in **Section 6.1.2**, the 95 percent UCL for each detected organic COPC has been calculated using the analytical data from the wells where the maximum COPC concentrations have been detected. Ninety-five percent UCL concentrations have not been calculated for COPC that have not been detected in any wells.

The 95 percent UCL concentrations for wells on the MEW Property and the data used to derive them are presented in **Table 6-1**. The 95 percent UCL concentrations were used in the Johnson-Ettinger Model to predict RME and CTE exposure point concentrations for vapor in on-Site buildings. The source concentrations for the non-detected organic COPC were assumed to be one-half the maximum MDL of the given chemical.

### 6.2 FATE AND TRANSPORT ANALYSIS

The inhalation exposures on Site and the inhalation, ingestion, and dermal contact exposures off Site are characterized as indirect, meaning exposures occur away from or in a different medium than the source. The COPC concentrations at the POE are typically lower than the representative value determined for the source medium. Therefore, to quantify exposure through indirect pathways, the reduction in COPC concentrations associated with each transport mechanism from the source medium to the POE must be characterized. The groundwater and vapor transport modeling are discussed in **Sections 6.2.1 and 6.2.2**, respectively.

#### 6.2.1 GROUNDWATER TRANSPORT ANALYSIS

Groundwater fate and transport modeling has been used to predict concentrations of organic COPC in the following media:

- Groundwater beneath the wetland; and
- Surface water in the creek



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A full description of the groundwater modeling is provided in **Appendix C**.

The predicted concentrations of organic COPC in groundwater within the limestone beneath the wetland area have been used to represent the concentration of COPC in tap water from Hypothetical Wells A, B and C. The three wells are assumed to extract water from the limestone, which is the water bearing unit in which the maximum concentrations of COPC are expected to occur. The locations of these wells are shown on **Figure 6-1**.

The groundwater model has also been used to predict the maximum concentrations of organic COPC in the shallow groundwater of the loess/alluvial deposits of the wetland area. Volatile COPC in this shallow groundwater is a potential source of vapors into future off-Site buildings constructed in the wetland area. The maximum concentrations in the shallow groundwater of the wetland area predicted by the groundwater model have been used as the source concentration in the off-Site Johnson-Ettinger model. This is discussed further in **Section 6.2.2**.

The groundwater model has also been used to estimate concentrations of organic COPC in surface water within the creek. The model has been used to estimate the total mass flux of COPC to the creek and the total groundwater flux (base flow) to the creek. Concentrations of COPC in the creek have been estimated by dividing the COPC mass flux to the creek by the predicted groundwater base flow. This method is conservative for the following reasons:

- Surface water is directly exposed to atmospheric air and therefore the loss of COPC due to volatilization is likely to be significant; and
- Groundwater discharging to the creek will be diluted by surface water. Surface water flow consists of groundwater base flow and surface water run-off. Surface water run-off has not been included in the dilution calculation and therefore dilution has been underestimated.

The groundwater model has been used to assess the fate and transport of organic COPC in the dissolved phase and not for the transport of particulate matter suspended in groundwater.

Analysis of filtered and unfiltered samples of PCB Aroclor 1260 has shown that, where detected, the concentrations in unfiltered samples are significantly higher than those in filtered samples. Aroclor 1260 has been detected in unfiltered samples in groundwater collected from several wells (MW-3, MW-5, MW-11, MW-11A and MW-12). Aroclor 1260 has not been detected in filtered samples from any wells sampled since Komex began monitoring, with the exception of well MW-11, where between 2 and 4.5 µg/L were detected in June and September 2000. The concentrations of this compound in filtered samples taken from this well have been below



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detection limit (0.5 µg/L) for the last 14 rounds of sampling. Aroclor 1260 has not been detected in any other wells on or off the MEW Property.

The large difference in concentration of Aroclor 1260 between filtered and unfiltered samples suggests that this compound is strongly sorbed to suspended sediment. This is consistent with the high organic carbon partition coefficient for this compound ( $3.09 \times 10^5$  L/kilograms [kg], U.S. EPA, 1996b). The source of Aroclor 1260 detected in the unfiltered samples is interpreted to be PCB-impacted sediment within the wells/fractures close to the wells. There is no evidence to suggest that COPC sorbed to particulate matter has been transported off-Site in groundwater. As a result, the migration of COPC sorbed to suspended matter in groundwater is not considered a viable pathway for COPC and has not been modeled.

Two types of groundwater fate and transport models have been developed: a fracture network model using Fracman, and an equivalent porous medium (EPM) model using Modflow-Surfact and MT3D. The methodology and results of this modeling are presented in detail in **Appendix C** and are summarized below.

#### **6.2.1.1 Fracture Network Modeling**

The fracture network modeling has been conducted to improve understanding of the migration of chemicals within the fractured limestone and to assess the validity of the EPM approach for predicting POE concentrations.

#### **6.2.1.2 Methodology**

The modeling involved a four stage process:

1. **Development of fracture networks.** The model code FracWorks XP was used to develop a fracture network model that represents the limestone within the vicinity of the Site. After initial calibration, this model was used to generate 20 different sets of fracture networks, all of which conform to field statistics and observations that were made of the fracture spacing and orientations.
2. **Estimating hydraulic conductivity of fracture networks.** A simple flow model was developed using Fracman to estimate the bulk hydraulic conductivities of the upper weathered and intermediate zones in each fracture network. This information was necessary to help validate the EPM modeling approach.
3. **Groundwater flow simulation at the Site.** Groundwater flow within the vicinity of the Site was simulated for a selection of the fracture networks by using Fracman. Fracture networks were chosen to represent a broad range of possible flow regimes within the limestone.



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4. **Chemical transport modeling.** Chemical migration within the fractures of the limestone was simulated for the same selection of fracture networks using Fracman. Fracman uses a particle tracking approach to identify active fractures and estimate chemical mass flux within the system. The modeling accounted for the natural attenuation processes dispersion, dilution and biodegradation. Retardation within the fractures is assumed negligible and was not modeled. The results of this modeling effort were combined with the groundwater modeling flow results in order to estimate the worst-case, off-Site chemical concentrations and fluxes that might occur within the limestone.

#### **6.2.1.3 Results**

The following conclusions were drawn from the fracture network modeling work:

- **Migration pathways.** Migration pathways are dependent on fracture connectivity. The results of the fracture modeling show that chemicals are likely to take a tortuous, indirect, “zig-zag”-shaped pathways through fractures towards the wetland area; and
- **Validation of EPM model.** The fracture network modeling predicted a range of possible concentrations of COPC. The worst-case concentrations that were predicted by the fracture network model are similar to those predicted by the preliminary EPM model. This shows that although the EPM model cannot predict the exact shape of the plume, it can be used to predict reasonable maximum concentrations of chemicals for use in the risk assessment. This is discussed further in **Section 6.2.2.2.**

This phase of work has shown that the EPM approach is suitable for the purposes of this risk assessment.

### **6.2.2 EPM MODELING**

The EPM model has been used for predicting RME concentrations of organic COPC in groundwater off Site and within surface water of the creek.

#### **6.2.2.1 Methodology**

The EPM model simulates groundwater flow in the limestone and overlying deposits in an area measuring 1.1 by 0.9 miles (1.8 x 1.4 km) that is centered on the MEW Property. Parameter values used in the model have been estimated from Site data, where available. Literature values and professional judgment have been used where no Site data exists. The intent of assumptions used in this modeling is to make the results relevant to the Site yet conservative, so



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that the risk associated with this exposure pathway will not be underestimated. This approach is consistent with U.S. EPA guidance (1989a).

The groundwater flow component of the model has been calibrated by modifying model parameter values within the expected range of variation until the predicted groundwater levels at the locations of existing wells are a reasonable approximation of observed levels.

The maximum concentrations detected on the MEW Property since the soil remediation was completed have been used as the source concentrations for the COPC, with the exception of undetected organics and TCE, as discussed below:

- **Undetected organic COPC.** Concentrations of undetected organics may vary from zero to the MDL. For this reason half the maximum MDL has been used as the source concentrations for these COPC. The maximum MDLs for these COPC are shown in **Table 3-5**.
- **TCE.** Use of the maximum measured source concentration of TCE of 13 µg/L results in a predicted concentration at well cluster MW-16 of 3.7 µg/L. This predicted concentration is lower than the measured concentrations in well MW-16B and MW-16C, where up to 9.9 µg/L TCE has been detected. Various methods were used to try and simulate the observed concentrations of TCE at this well location. Firstly, TCE was modeled using no biodegradation. The resultant plume was extensive and led to highly unrealistic concentrations in the other off-Site wells. Secondly, the on-Site source concentration of TCE was increased to 35 µg/L, such that the predicted concentrations at well cluster MW-16 were approximately equal to those observed. The second option led to a more satisfactory calibration with observed concentrations and therefore this higher source concentration has been used for TCE in the POE prediction runs. The need to increase source concentrations to accurately predict those observed at well cluster MW-16 may indicate that an undiscovered source of TCE exists.

Note that the maximum concentrations of filtered Aroclor 1260 have been used as the source concentration for this COPC. Unfiltered concentrations are not representative of dissolved phase concentrations and are therefore not suitable for use as source concentrations for the groundwater modeling.

Two source areas have been assigned; one in the south east corner of the Site and one in the center of the Site. Note that 1,2,4-trichlorobenzene has been modeled with two source zones (Source Areas 1 and 2). Chemical transport parameters have been selected from literature



values. Reasonable maximum values of biodegradation half-life for the detected organic COPC have been selected to take account of the uncertainty in this parameter value. For undetected organics, the model runs have been conducted with no biodegradation.

Sensitivity analysis was conducted as part of the fracture network modeling and the EPM modeling to test the effect of uncertainty in model input parameters on the prediction of COPC concentrations in groundwater off Site.

Although the EPM model can reasonably predict COPC concentrations in a simulated fracture and model results are valid for scales of evaluation that are likely to include one or more fractures, the exact occurrence, location and geometry of fractures in the field are not known. Therefore, model results can be used to assess worst-case risk to hypothetical receptors (by wells modeled as being installed in simulated fractures); however, the results can not be used at the scale necessary to precisely locate wells for either remediation or water supply purposes.

#### **6.2.2.2 Results**

The EPM model has been used to predict RME and CTE concentrations of organic COPC in groundwater at the following points:

- Groundwater extracted from the three hypothetical wells (A, B and C) completed within the limestone (**Figure 6-1**);
- The alluvial/loess deposits off Site; and
- Surface water in the creek.

The predicted RME and CTE concentrations are summarized in **Table 6-2**.

The COPC plumes predicted by the groundwater model are shown in **Appendix C**. Caution must be adopted when interpreting these plumes. The objective of the EPM modeling is to predict RME and CTE POE concentrations and not to accurately predict the location of plumes or off-Site concentrations at specified locations. Accurate prediction of plume shape is not possible due to the heterogeneous nature of groundwater flow in fractured media. This has been confirmed by the fracture network modeling, which shows that there are a large number of possible flow paths between the MEW Property and the wetland area.

The locations of Hypothetical Wells A and B have been chosen such that they represent worst-case off-Site concentrations in the limestone. In reality, the maximum off-Site concentrations may not occur at these exact locations. They are likely to occur within fractures connected to the source zone and the exact locations of these fractures are not known. However, the



modeling work has demonstrated that the maximum off-Site concentrations are highly unlikely to exceed the values predicted in Hypothetical Wells A and B and therefore the predicted concentrations at these well locations are considered suitable for use as POE concentrations for the risk assessment. To ensure that absolute worst-case conditions are assessed, the maximum concentrations from these two wells have been used to define concentrations for a fourth Hypothetical Well D. Well B concentrations were the highest and subsequently used as well D concentrations for 11 chemicals and Well A concentrations were used for the remaining 37 chemicals. The predicted concentrations in Hypothetical Well D are also presented in **Table 6-2**.

The location of Hypothetical Well C has been chosen such that it lies at the boundary of the predicted organic COPC plume.

The EPM model predicts higher concentrations of COPC in off-Site groundwater than those measured. The predicted concentrations of COPC in Hypothetical Well B are significantly higher than the observed concentrations in nearby monitoring wells MW-15A and MW-15B, completed within the limestone. As discussed in **Appendix C**, the fracture modeling has shown that the likelihood of a monitoring well intersecting an active COPC fracture migration pathway is relatively low. For this reason, it is possible that the observed concentrations of COPC in monitoring wells MW-15A and MW-15B are unrepresentative of maximum concentrations within their locality. To maintain a conservative approach, the modeled concentrations at this locality have been used as POE concentrations for the risk characterization rather than the lower observed concentrations.

### **6.2.3 AIR TRANSPORT ANALYSIS**

An analysis of the transport of COPC from the Site through the air pathway has been conducted to assess potential receptor exposure concentrations in indoor air. This section describes the methodology used in the air transport analysis.

The air transport analysis follows guidelines developed by the U.S. EPA (2002d). The sources of air emissions and the COPC released have been identified from Site-specific information. Throughout the analysis, Site-specific data have been used where available. When such data were unavailable, conservative assumptions found in appropriate literature have been used. Regulatory default options and values have been used when applicable. The intent of assumptions used in this analysis is to make the results relevant to the Site yet conservative, so that the risk associated with this exposure pathway will not be underestimated. This approach is consistent with U.S. EPA guidance (1989a).



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### 6.2.3.1 Methodology

Vapor emissions pose a unique hazard to receptors within buildings constructed over contaminated soils and groundwater. A building traps the emissions indoors, and in many cases the resultant indoor air concentrations are significantly higher than those in the ambient air.

A review of vapor intrusion models was conducted to identify an appropriate model for estimating potential indoor air concentrations resulting from COPC that may volatilize from soil and enter future buildings. The models estimate the chemical concentration in soil gas, the subsequent movement of the vapor phase of the chemical upward to the atmosphere, and then the concentration of the chemical in indoor air. U.S. EPA recommends the Johnson-Ettinger Model for Subsurface Vapor Intrusion into Buildings. Copies of this model and an updated manual are provided and maintained by U.S. EPA on its Internet site (U.S. EPA, 2003c). The following summarizes several of the major points found in this reference.

The Johnson-Ettinger intrusion model incorporates several fundamental assumptions (1991):

- The model considers both diffusive flux and convection driven flow.
- The chemical is assumed to be present as a non-diminishing, steady state source even though, for most chemicals, biodegradation and other attenuation forces are expected to occur in subsurface media over time. This is therefore a conservative assumption.
- The system is assumed to be at equilibrium, and exposure to chemicals above equilibrium levels due to shutdown of the building ventilation system is assumed to be trivial in terms of exposure duration.
- It is assumed that flux occurs only through infiltration areas such as cracks in the building slab and that flux through the building slab itself is insignificant.
- All vapors originating directly below the foundation are assumed to enter the building. This too, is a conservative assumption.

The vapor intrusion model was proposed as a method of calculating chemical concentrations in indoor air based on specified chemical concentrations in soil gas (Johnson and Ettinger, 1991). Physical parameters such as moisture content, dry-soil density, porosity, and effective air permeability affect the rate at which the vapors from a volatile chemical migrate through the soils. The dominant mechanism of vapor migration is closely correlated with the depth to source and soil permeability (Johnson and Ettinger, 1991).



For the indoor air analysis, Site-specific values for these parameters have been used where available. Conservative default values have been identified based on known Site characteristics for parameters that were not measured directly. Although buildings have not yet been constructed, regulatory guidance and literature sources have been consulted to identify appropriate values for building parameters (e.g. building dimensions and foundation characteristics).

The Johnson-Ettinger model has been used for predicting indoor air concentrations of volatile COPC in a future commercial building located on Site and a future residential building located on the wetland area off-Site. The parameter values used in the Johnson-Ettinger model for these two scenarios are given in **Tables D** and **E** below.

**Table D: Parameter Values Used in Vapor Model – Commercial Building on MEW Property**

Parameter	Value	Justification
Initial groundwater concentration	See Table G	95 percent UCL groundwater source concentrations
Average groundwater temperature	60°F (15.56°C)	Average temperature of shallow groundwater in Cape Girardeau region (Johnson and Ettinger, 1991)
Depth below grade to bottom of enclosed space floor	6.6 feet (200 cm)	Future buildings on MEW Property assumed to have a basement
Depth below grade to water table	40 feet (1212 cm)	Average depth to water table at MEW property
Thickness of soil stratum A	35 feet (1067 cm)	Average thickness of loess deposits at the MEW Property is 35 feet
Thickness of soil stratum B	5 feet (145 cm)	Average thickness of weathered limestone above water table
Soil stratum A soil type	Silty clay	Loess is described as a silty clay
Soil stratum A bulk density	97 lb/ft <sup>3</sup> (1554 g/cm <sup>3</sup> )	Bulk density of loess derived from Site data
Soil stratum A total porosity	0.385	Default value for a silty clay given in Johnson and Ettinger
Soil stratum A water filled porosity	0.197	Default value for a silty clay given in Johnson and Ettinger
Soil stratum B soil type	Silty clay	Weathered Upper zone of limestone is characterized by fractures infilled with loess. Properties of loess (see Stratum A) considered most appropriate for this zone.
Soil stratum B bulk density	97 lb/ft <sup>3</sup> (1554 g/cm <sup>3</sup> )	
Soil stratum B total porosity	0.385	
Soil stratum B water filled porosity	0.197	
Enclosed space floor thickness	3.9 inches (10 cm)	Default value in Johnson and Ettinger
Soil/building pressure differential	40 g/cm-s <sup>2</sup>	Default value in Johnson and Ettinger
Enclosed space floor length	32.8 feet (1000 cm)	Default value in Johnson and Ettinger



Parameter	Value	Justification
Initial groundwater concentration	See Table G	95 percent UCL groundwater source concentrations
Enclosed space floor width	32.8 feet (1000 cm)	Default value in Johnson and Ettinger
Enclosed space height	12 feet (366 cm)	Default value in Johnson and Ettinger
Floor-wall crack width	0.04 inches (0.1 cm)	Default value in Johnson and Ettinger
Indoor air exchange rate (unitless)	0.25	Default value in Johnson and Ettinger
Average vapor flow rate into building	1.5 L/ft (5 L/m)	Default value in Johnson and Ettinger



**Table E: Parameter Values Used in Vapor Model – Residential Building on Wetland**

Parameter	Value	Justification
Initial groundwater concentration	See Table G	95 percent UCL groundwater source concentrations
Average groundwater temperature	60°F (15.56°C)	Average temperature of shallow groundwater in Cape Girardeau region (Johnson and Ettinger, 1991)
Depth below grade to bottom of enclosed space floor	0.5 feet (15 cm)	Future buildings on wetland area are unlikely to have basement due to proximity of water table to surface
Depth below grade to water table	4 feet (122 cm)	Minimum depth to water table recorded on wetland
Thickness of soil stratum A	4 feet (122 cm)	One soil type assumed above water table
Soil stratum A soil type	Silty clay	Upper 4 feet of deposits in wetland area are described as a silty clay
Soil stratum A bulk density	101.7 lb/ft <sup>3</sup> (1.63 g/cm <sup>3</sup> )	Default value for a silty clay given in Johnson and Ettinger
Soil stratum A total porosity	0.385	Default value for a silty clay given in Johnson and Ettinger
Soil stratum A water filled porosity	0.197	Default value for a silty clay given in Johnson and Ettinger
Enclosed space floor thickness	3.9 inches (10 cm)	Default value in Johnson and Ettinger
Soil/building pressure differential	40 g/cm-s <sup>2</sup>	Default value in Johnson and Ettinger
Enclosed space floor length	32.8 feet (1000 cm)	Default value in Johnson and Ettinger
Enclosed space floor width	32.8 feet (1000 cm)	Default value in Johnson and Ettinger
Enclosed space height	12 feet (366 cm)	Default value in Johnson and Ettinger
Floor-wall crack width	0.04 inches (0.1 cm)	Default value in Johnson and Ettinger
Indoor air exchange rate (unitless)	0.25	Default value in Johnson and Ettinger
Average vapor floor rate into building	1.5 L/ft (5 L/m)	Default value in Johnson and Ettinger

U.S. EPA guidance (2002d) recommends that the vapor intrusion pathway be only considered for chemicals with a Henry's Law Constant of greater than  $1 \times 10^{-5}$  partial pressure molar concentration (atm.m<sup>3</sup>/mol). For COPC with a Henry's Law Constant of less than this value, vapor migration is not considered a viable pathway and as a result these COPC have not been included in the vapor modeling.

The 95 percent UCL groundwater concentrations described in **Section 6.1.4** have been used as the source concentrations for predicting RME indoor air concentrations for detected organic



COPC on the MEW Property. Note that the concentrations for filtered samples have been used to estimate RME source concentrations for PCB Aroclor 1260. This is because volatilization will occur from the dissolved phase and not directly from soil sorbed PCBs. Concentrations of non-detectable organic COPC may vary from zero to the MDL. For this reason half the maximum MDL has been used as the source concentrations for these COPC. The maximum MDLs for these COPC are shown in **Table 3-5**.

The groundwater modeling has been used to predict RME concentrations of COPC that could arise in groundwater within the surficial deposits beneath the wetland area (**Section 6.2.2**). These concentrations have been used for predicting indoor air concentrations in future buildings located on the wetland area.

The groundwater COPC source concentrations for use in the Johnson-Ettinger model are presented in **Table 6-3**.

Default parameter values for building dimensions, floor thickness, crack width, pressure differential and vapor flow rate have been used in the vapor modeling. The U.S. EPA recommends the use of these values (U.S. EPA, 2003c).

Any future buildings constructed on the MEW Property may have basements and therefore the allowance for a basement has been made for modeling on-Site exposure. This assumption is conservative. The construction of basements in the wetland area is considered unlikely due to the shallow depth to the water table in this area.

Chemical-specific properties for the COPC are included in the most recent Johnson-Ettinger model (U.S. EPA, 2003c) with the exception of the Aroclors, benzo(a)pyrene and bis(2-chloroisopropyl) ether. Where available, values from the previous version of the Johnson-Ettinger model have been used (U.S. EPA, 1997b). No values could be found for five COPC; Aroclor 1221, Aroclor 1232, Aroclor 1248, Benzo(a)pyrene, and bis(2-chloroisopropyl) ether. The vapor risk from these COPC has not been modeled. The chemical specific parameter values used in the vapor modeling are consistent with those used in the groundwater modeling.

### **6.2.3.2 Results**

The Johnson-Ettinger model has been used to predict the indoor air concentrations in a building with an infinite source. The model input and results sheets are presented in **Appendix E**. The predicted RME and CTE indoor air concentrations are tabulated in **Table 6-4**. The same POE concentrations were used for both RME and CTE.



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### 6.3 SUMMARY OF POINT OF EXPOSURE CONCENTRATIONS

The results of the fate and transport modeling have been used to estimate the majority of COPC POE concentrations. Vapor modeling has been used to estimate indoor air POE concentrations in future buildings. Groundwater modeling has been used to estimate POE concentrations in tap water from future off-Site wells and surface water in the creek.

A summary of the POE concentrations and their derivation is given in **Table 6-5**.



## 7 RISK CHARACTERIZATION

Risk characterization is the final step in the risk quantification process, combining the information developed in the toxicity assessment (Section 4) and the exposure point concentrations (Section 6). Risk characterization is the estimate of potential carcinogenic and non-carcinogenic effects of COPC over a lifetime of exposure. The risk from potential carcinogenic effects resulting from exposure to Site-related COPC is presented as the ILCR. The risk of potential non-carcinogenic toxic effects is presented as the HI.

Section 7.1 presents the quantitative exposure assessment. Section 7.2 describes the characterization of potential carcinogenic and non-carcinogenic risks.

### 7.1 EXPOSURE QUANTIFICATION

The exposure assessment process quantifies the magnitude, frequency, and duration of exposure for those populations and pathways selected for quantitative evaluation in the CEM (Section 4). Exposure pathways identified as being complete in the CEM were:

- Inhalation of indoor air impacted by the intrusion of vapors through the floor;
- Inhalation of indoor air impacted by the volatilization of vapors from tap water;
- Ingestion of tap water;
- Dermal contact with tap water;
- Incidental ingestion of surface water in the creek;
- Dermal contact with surface water in the creek;
- Incidental ingestion of shallow groundwater in the wetland area; and
- Dermal contact with shallow groundwater in the wetland area.

The following sections present the standard equations for estimating human intake with the selected exposure pathways and the exposure factors required to conduct the analysis.

#### 7.1.1 AIR EXPOSURE - INHALATION

Equation 6-16 from RAGS (U.S. EPA, 1989a) has been used to quantify intake from the inhalation pathway:

$$I_a = (C_a)(IR)(ET)(EF)(ED)/(BW)(AT) \dots\dots\dots (7-1)$$



where

$I_a$	=	intake from inhalation of a COPC in air (mg/kg-d)
$C_a$	=	concentration of COPC in air (mg/m <sup>3</sup> )
IR	=	inhalation rate (m <sup>3</sup> /h)
ET	=	exposure time (h/d)
EF	=	exposure frequency (d/y)
ED	=	exposure duration (y)
BW	=	body weight (kg)
AT	=	averaging time (d), ED x 365d/y (non-carcinogens), 70y x 365d/y (carcinogens)

The estimation of the COPC concentration in indoor air arising from vapor intrusion through the floor has been discussed in **Section 6.2.3**. The COPC concentration in indoor air arising from volatilization from tap water ( $C_{tw}$ ) is calculated from the volatilization factor using Equation 7-2:

$$C_{intw} = C_{tw} * VF_{tw} \dots\dots\dots (7-2)$$

$C_{intw}$	=	concentration of COPC in indoor air (mg/m <sup>3</sup> )
$C_{tw}$	=	concentration of COPC in tap water (µg/L)
$VF_{tw}$	=	receptor-specific volatilization attenuation factor (dimensionless) (0.0005, U.S. EPA, 1991)

For volatile chemicals, an upperbound volatilization constant ( $VF_{tw}$ ) of 0.0005 is used that is based on all uses of household water (*e.g.* showering, laundering, and dish washing). Certain assumptions are made including the volume of water used in a residence for a family of four is 720 L/day, the volume of the dwelling is 150,000 L, and the air exchange rate is 0.25 air changes/hour (Andelman in RAGS Part B as cited in U.S. EPA, 2003b). The average transfer efficiency weighted by water use is 50 percent (*i.e.* half of the concentration of each chemical in water will be transferred into air by all water uses). According to the U.S. EPA (2003b), the range of transfer efficiencies extends from 30% for toilets to 90% for dishwashers.

Note that the volatilization from tap water is not considered a plausible pathway for organic COPC with a Henry's Law constant of less than 10<sup>-5</sup> atm.m<sup>3</sup>/mol. Exposure for these COPC via this pathway is therefore assumed to be zero.



To maintain a conservative approach, it is assumed that the tap water comes from a domestic supply groundwater well with no treatment. The concentration of COPC in tap water is therefore assumed equal to the concentration in the extracted groundwater.

### 7.1.2 WATER - INGESTION

Equation 6-11 from RAGS (U.S. EPA, 1989a) has been used to quantify intake from the ingestion of water:

$$I_w = (C_w)(IR)(EF)(ED)/(BW)(AT) \dots\dots\dots (7-3)$$

where

- $I_w$  = intake from ingestion of a COPC in water (mg/kg-d)
- $C_w$  = concentration of COPC in water (mg/m<sup>3</sup>)
- $IR$  = ingestion rate (l/d)
- $EF$  = exposure frequency (d/y)
- $ED$  = exposure duration (y)
- $BW$  = body weight (kg)
- $AT$  = averaging time (d),  $ED \times 365\text{d/y}$  (non-carcinogens),  $70\text{y} \times 365\text{d/y}$  (carcinogens)

The groundwater model has been used to predict RME and CTE concentrations in groundwater at three hypothetical well locations off-Site and in groundwater discharging to the creek. These results have been used to estimate the potential exposure from ingestion of tap water and from incidental ingestion of the creek surface water.

### 7.1.3 WATER – DERMAL CONTACT

The absorbed dose from dermal contact with water has been calculated using the methodology presented in the RAGS Part E document (U.S. EPA, 2004b):

$$DAD = (DA_{\text{event}})(EV)(ED)(EF)(SA)/(BW)(AT) \dots\dots\dots (7-4)$$

where

- $DAD$  = absorbed dose through dermal contact with COPC in water (mg/kg-d)
- $DA_{\text{event}}$  = absorbed dose per event (mg/cm<sup>2</sup>-event) (from equation 6-4)
- $EV$  = event frequency (events/day)
- $ED$  = exposure duration (y)
- $EF$  = exposure frequency (d/y)



SA = skin surface area available for contact (cm<sup>2</sup>)  
 BW = body weight (kg)  
 AT = averaging time (d), ED x 365d/y (non-carcinogens), 70y x 365d/y (carcinogens)

The absorbed dose per event for organic compounds is given by either equation 7-5 or 7-6:

If  $t_{event} \leq t^*$ , 
$$DA_{event} = 2.FA.K_p.C_w \sqrt{\frac{6.t_{event}.I_{event}}{\pi}} \dots\dots\dots (7-5)$$

If  $t_{event} > t^*$ , 
$$DA_{event} = FA.K_p.C_w \left[ \frac{t_{event}}{1+B} + 2.t_{event} \left( \frac{1+3.B+3.B^2}{(1+B)^2} \right) \right] \dots\dots\dots (7-6)$$

COPC-specific parameter values required for equations 7-5, 7-6 and 7-7 have been obtained, from the RAGS Part E document (U.S. EPA, 2004b) or calculated using the USEPA spreadsheet. These are presented in **Table 7-1**. Equation 7-7 has therefore been used to model dermal uptake for these compounds.

The groundwater model has been used to predict RME concentrations in groundwater at three hypothetical well locations off-Site, shallow groundwater within the wetland area and in surface water within the creek (**Table 6-2**). These results have been used to estimate the potential exposure from dermal contact with tap water, groundwater in excavations and with the creek surface water.

## 7.1.4 EXPOSURE FACTORS

Exposure factors have been derived for four receptor types; an on-Site adult worker, an off-Site adult construction workers, an off-Site adult resident, and an off-Site child resident. Exposure factors are discussed in the following sections.

### 7.1.4.1 On-Site Adult Worker

The adult worker receptor has been assumed for exposure scenarios on the MEW Property. The CEM model identified the inhalation of indoor air from vapor intrusion through the floor as the only complete pathway for this receptor. Exposure factors for RME related to the inhalation of indoor air appropriate for an adult worker are presented in **Table F**. The values presented in this table are considered suitable for calculating RME to this receptor type. Exposure factors for CTE related to the inhalation of indoor air appropriate for an adult worker are presented in **Table G**.



**Table F: Reasonable Maximum Exposure Parameters for On-Site Adult Worker**

Pathway	Parameter	Adult Worker	Reference
Inhalation of Volatilized Gases	IR – Inhalation Rate (m <sup>3</sup> /h)	2	Based on 20 m <sup>3</sup> in one 10 hour work day (U.S. EPA, 1991a)
	EF – Exposure Frequency (d/y)	250	U.S. EPA, 1991a
	ED – Exposure Duration (y)	25	U.S. EPA, 1991a
	ET – Exposure Time, Outdoors (h/d)	0	Commercial worker assumed to spend entire 10 hour working day indoors in place of work
	ET – Exposure Time, Indoors (h/d)	10	
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	U.S. EPA, 1991a
	AT – Averaging Time, Non-carcinogen (d)	9,125	U.S. EPA, 1991a



**Table G: Central Tendency Exposure Parameters for On-Site Adult Worker**

Pathway	Parameter	Adult Worker	Reference
Inhalation of Volatilized Gases	IR – Inhalation Rate (m <sup>3</sup> /h)	16	Assumes moderate activity (U.S. EPA, 1997a)
	EF – Exposure Frequency (d/y)	219	U.S. EPA, 1993
	ED – Exposure Duration (y)	66	U.S. EPA, 1993
	ET – Exposure Time, Outdoors (h/d)	0	Commercial worker assumed to spend entire 10 hour working day indoors in place of work
	ET – Exposure Time, Indoors (h/d)	10	
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	U.S. EPA, 1991a
	AT – Averaging Time, Non-carcinogen (d)	2,409	365 d/yr x exposure duration of 5 yr



### 7.1.4.2 Off-Site Adult Construction Worker

The adult construction worker is considered a potential off-Site receptor. The CEM model identified the incidental ingestion and dermal contact with shallow groundwater in the wetland area to be the only complete pathways for this receptor. Exposure factors related to this receptor for RME are presented in **Table H**. The values presented in this table are considered suitable for calculating RME to this receptor type. Exposure factors related to this receptor for CTE are presented in **Table I**.

**Table H: Reasonable maximum exposure parameters for off-Site construction worker**

Pathway	Parameter	Construction Worker	Reference
Incidental Ingestion of groundwater	IR – Ingestion Rate (l/d)	0.12	U.S. EPA, 2000 assuming 12 hour working day
	EF – Exposure Frequency (d/y)	250	-
	ED – Exposure Duration (y)	1	RAIS, 2004
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	70 years (U.S. EPA, 1991a)
	AT – Averaging Time, Non-carcinogen (d)	365	1 year duration (RAIS, 2004)
Dermal Contact with Groundwater	EV = Event Frequency (events/d)	1	U.S. EPA, 2004b
	ED – Exposure Duration (y)	1	RAIS, 2004
	EF – Exposure Frequency (d/y)	250	-
	SA = Surface Area (cm <sup>2</sup> )	3,300	U.S. EPA, 2004b
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	70 years (U.S. EPA, 1991a)
	AT – Averaging Time, Non-carcinogen (d)	365	1 year duration (RAIS, 2004)
	t <sub>event-RME</sub> = Event Duration (h)	12	Assumed number of hours worked/d for construction worker

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**Table I: Central Tendency Exposure Parameters For Off-Site Construction Worker**

Pathway	Parameter	Construction Worker	Reference
Incidental Ingestion of groundwater	IR – Ingestion Rate (l/d)	0.04	U.S. EPA, 2000 assuming 4 hours working in water working day
	EF – Exposure Frequency (d/y)	219	-
	ED – Exposure Duration (y)	1	RAIS, 2004
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	70 years (U.S. EPA, 1991a)
	AT – Averaging Time, Non-carcinogen (d)	365	1 year duration (RAIS, 2004)
Dermal Contact with Groundwater	EV = Event Frequency (events/d)	1	U.S. EPA, 2004b
	ED – Exposure Duration (y)	1	RAIS, 2004
	EF – Exposure Frequency (d/y)	219	-
	SA = Surface Area (cm <sup>2</sup> )	3,300	U.S. EPA, 2004b
	BW – Body Weight (kg)	70	U.S. EPA, 1991a
	AT – Averaging Time, Carcinogen (d)	25,550	70 years (U.S. EPA, 1991a)
	AT – Averaging Time, Non-carcinogen (d)	365	1 year duration (RAIS, 2004)
	t <sub>event-RME</sub> = Event Duration (h)	4	Assumed CTE number of hours worked/d for construction worker

#### 7.1.4.3 Off-Site Resident

The child and adult resident receptors have been assumed for off-Site exposure scenarios. The CEM model identified the inhalation of indoor air, ingestion and dermal contact with tap water and the incidental ingestion and inhalation of surface water in the creek as the complete exposure pathways for these receptors. Exposure factors appropriate for these receptor types and pathways have been obtained from the RAGS guidance, where available. Justification for exposure factors not provided in these sources is given below. The exposure factors used to quantify RME to residential receptors are presented in Table J. The values presented in this table are considered suitable for calculating RME to this receptor type. The exposure factors used to quantify CTE to residential receptors are presented in Table K.



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Exposure to tap water and indoor air is assumed to occur 350 days per year for a resident. Exposure to the creek is considered to occur on a less frequent basis and therefore an exposure frequency of 1 day per week (52 days per year) has been assumed.

Total body surface areas have been assumed for the reasonable maximum dermal contact exposures. This accounts for contact with tap water during showering and bathing. Swimming is considered unlikely in the creek due to the shallow depth of water; however, the conservative assumption is made that complete immersion of the body could occur and therefore total body area has been assumed for reasonable maximum exposure to creek water. Contact with creek water for the hands, lower arms, feet, and lower legs has been assumed for CTE. The duration of dermal contact is assumed to be one hour for showering and bathing activities in tap water. The assumption of two hours duration per event for dermal contact with the creek is considered conservative.

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**Table J: Reasonable Maximum Exposure Parameters for Residential Receptor**

Pathway	Parameter	Adult Resident	Child Resident	Reference
Inhalation of Volatilized Gases	IR – Inhalation Rate (m <sup>3</sup> /h)	0.83	0.42	U.S. EPA, 1991a
	EF – Exposure Frequency (d/y)	350	350	U.S. EPA, 1988c
	ED – Exposure Duration (y)	24	6	Total of 30 year exposure (U.S. EPA, 1991a)
	ET – Exposure Time, Outdoors (h/d)	0	0	Conservatively assumed to spend 24 hours/day indoors
	ET – Exposure Time, Indoors (h/d)	24	24	
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	8,760	2,190	U.S. EPA, 1988c
Ingestion of tap water	IR – Ingestion Rate (l/d)	2	1	U.S. EPA, 2000
	EF – Exposure Frequency (d/y)	350	350	U.S. EPA, 1988c
	ED – Exposure Duration (y)	24	6	Total of 30 year exposure (U.S. EPA, 1991a)
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	8,760	2,190	U.S. EPA, 1988c
Dermal contact with tap water	EV = Event Frequency (events/d)	1	1	U.S. EPA, 2004b
	ED – Exposure Duration (y)	24	6	Total of 30 year exposure (U.S. EPA, 1991a)
	EF – Exposure Frequency (d/y)	350	350	U.S. EPA, 2004b
	SA = Surface Area (cm <sup>2</sup> )	18,000	6,600	U.S. EPA, 2004b
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	8,760	2,190	U.S. EPA, 1988c
	t <sub>event-RME</sub> = Event Duration (h)	0.58	1	U.S. EPA, 2004b



**Table J: Reasonable Maximum Exposure Parameters For Residential Receptor  
(continued)**

Pathway	Parameter	Adult Resident	Child Resident	Reference
Incidental Ingestion of creek water	IR – Ingestion Rate (l/d)	0.05	0.05	U.S. EPA, 2000 (assuming 1 hour exposure swimming)
	EF – Exposure Frequency (d/y)	52	52	Assumes 1 day per year
	ED – Exposure Duration (y)	24	6	Total of 30 year exposure (U.S. EPA, 1991a)
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	8,760	2,190	U.S. EPA, 1988c
Dermal Contact with Surface Water	EV = Event Frequency (events/d)	1	1	U.S. EPA, 2004b
	ED – Exposure Duration (y)	24	6	Total of 30 year exposure (U.S. EPA, 1991a)
	EF – Exposure Frequency (d/y)	52	52	Assumes 1 day per year
	SA = Surface Area (cm <sup>2</sup> )	18,000	6,600	U.S. EPA, 2004b (showering parameters assumed)
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	8,760	2,190	U.S. EPA, 1988c
	t <sub>event-RME</sub> = Event Duration (h)	2	2	Assumed that water remains in contact with skin for 1 hour after immersion



**Table K: Central Tendency Exposure Parameters For Residential Receptor**

Pathway	Parameter	Adult Resident	Child Resident	Reference
Inhalation of Volatilized Gases	IR – Inhalation Rate (m <sup>3</sup> /h)	0.63	0.36	U S EPA, 1997a
	EF – Exposure Frequency (d/y)	350	350	U.S. EPA, 1988c
	ED – Exposure Duration (y)	9	2	SRS, 2000
	ET – Exposure Time, Outdoors (h/d)	1.5	5	U S EPA, 1997a
	ET – Exposure Time, Indoors (h/d)	21	19	
	BW – Body Weight (kg)	70	15	U.S EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	3,285	730	U S EPA, 1988c
Ingestion of tap water	IR – Ingestion Rate (l/d)	1.4	0.315	U.S. EPA, 1997a
	EF – Exposure Frequency (d/y)	350	350	U S EPA, 1988c
	ED – Exposure Duration (y)	9	2	SRS, 2000
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	3,285	730	U.S. EPA, 1988c
Dermal contact with tap water	EV = Event Frequency (events/d)	1	1	U.S EPA, 2004b
	ED – Exposure Duration (y)	9	2	SRS, 2000
	EF – Exposure Frequency (d/y)	350	350	U S EPA, 2004b
	SA = Surface Area (cm <sup>2</sup> )	18,000	6,600	U.S EPA, 2004b
	BW – Body Weight (kg)	70	15	U.S EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	3,285	730	U.S EPA, 1988c
	t <sub>event-RME</sub> = Event Duration (h)	0.25	0.33	U.S. EPA, 2004b



**Table K: Central Tendency Exposure Parameters For Residential Receptor  
(continued)**

Pathway	Parameter	Adult Resident	Child Resident	Reference
Incidental Ingestion of creek water	IR – Ingestion Rate (l/d)	0.01	0.05	U.S. EPA, 2000 (assuming 1 hour exposure wading)
	EF – Exposure Frequency (d/y)	52	52	Assumes 1 day per year
	ED – Exposure Duration (y)	9	2	SRS, 2000
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	3,285	730	U.S. EPA, 1988c
Dermal Contact with Surface Water	EV = Event Frequency (events/d)	1	1	U.S. EPA, 2004b
	ED – Exposure Duration (y)	9	2	SRS, 2000
	EF – Exposure Frequency (d/y)	52	52	Assumes 1 day per year
	SA = Surface Area (cm <sup>2</sup> )	6,170	2,300	Assumes exposure via wading. Hands, lower arms, feet and lower legs become wet 50 <sup>th</sup> percentile values used. U.S. EPA, 2004b
	BW – Body Weight (kg)	70	15	U.S. EPA, 1988c
	AT – Averaging Time, Carcinogen (d)	25,550	25,550	U.S. EPA, 1988c
	AT – Averaging Time, Non-carcinogen (d)	3,285	730	U.S. EPA, 1988c
	t <sub>event-RME</sub> = Event Duration (h)	2	2	Assumed that water remains in contact with skin for 1 hour after immersion



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## 7.2 RISK CHARACTERIZATION

In this risk assessment, potential health effects to humans following exposure to Site-related COPC have been estimated using methods established by U.S. EPA. Key documents used as guidance for preparing the risk assessment are presented in **Section 11** and are referenced throughout the following paragraphs.

### 7.2.1 HEALTH EFFECTS CONCEPTS FOR QUANTITATIVE RISK ASSESSMENT

In risk assessments, two different values are calculated to evaluate potential health impacts: the ILCR and the non-carcinogenic HI. The ILCR is an upper-bound estimate of the incremental cancer risk for individuals who may have been exposed to Site-related COPC. The ILCR is compared to a threshold probability to determine whether the projected risk poses an unacceptable health threat. The U.S. EPA uses the general  $10^{-4}$  to  $10^{-6}$  risk range as a target range within which the Agency strives to manage risks as part of a Superfund clean-up (U.S. EPA, 1991c). Therefore, for the purposes of this risk assessment, a risk is considered to be acceptable when the cumulative carcinogenic Site risk to an individual based on RME for both current and future land use is less than  $1 \times 10^{-4}$  and the non-carcinogenic hazard quotient is less than 1 (U.S. EPA, 1990b, 1991b, 1991c). The exact point of departure is established on a Site-specific basis and is highly dependent upon land-use conditions.

The potential health effects resulting from exposure to non-carcinogenic COPC are evaluated by comparing a receptor's exposure or intake level to the RfD of that COPC. The ratio of intake over the RfD is the hazard quotient (HQ) (U.S. EPA, 1989a). An RfD is the daily exposure level likely to cause no appreciable risk of deleterious effects during a lifetime. If the HQ is greater than 1 or "above unity," there may be concern for potential non-carcinogenic health effects. The level of concern increases as the HQ increases above unity, although the two are not linearly related (U.S. EPA, 1989a). When receptors are exposed to more than one COPC through multiple pathways, it is useful to develop a total hazard index (HI). The HI is the summation of HQs across pathways (U.S. EPA, 1986). The HI is also compared with a threshold level of unity.

### 7.2.2 METHODS FOR CHARACTERIZING HEALTH EFFECTS

Risks from exposure to hazardous COPC are calculated for carcinogenic and/or non-carcinogenic effects as appropriate. Fifteen compounds are considered non-carcinogens (**Table C, Section 4.4**) and therefore the risks for these compounds have been considered for non-



carcinogenic effects only. The remaining 37 COPC are considered to be carcinogens. Risks to these compounds have been calculated for their carcinogenic and non-carcinogenic effects.

### 7.2.2.1 Carcinogenic Effects

The risk attributed to exposure to carcinogenic compounds is estimated as the increased probability of an individual developing cancer over a lifetime as a result of the exposure. At low doses, the risk of developing cancer (ILCR) is determined as follows (U.S. EPA, 1989a):

$$\text{Risk} = (\text{CDI})(\text{CSF}) \dots\dots\dots (7-7)$$

An exposed receptor's risk is presented as the ILCR and is calculated by multiplying the chronic daily intake (CDI) values for carcinogenic effects by the CSFs of the carcinogenic COPC. As discussed in **Section 4.4**, the risks to receptors have been calculated using a range of slope factors for TCE.

If a receptor is exposed via a single pathway to several carcinogens, the following equation is used to sum cancer risks:

$$\text{Risk}_i = \text{Risk}(\text{COPC}_1) + \text{Risk}(\text{COPC}_2) + \dots \text{Risk}(\text{COPC}_n) \dots\dots\dots (7-8)$$

where

$\text{Risk}_i$  = total risk of cancer incidence for a given pathway  
 $\text{Risk}(\text{COPC}_n)$  = individual carcinogenic COPC risk

Similarly, if a receptor is exposed through multiple pathways, the total ILCR can be calculated by summing the pathway-specific risks (U.S. EPA, 1986).

The ILCR has been calculated for the child and adult residential receptors separately. The risks to these receptors have been summed for residential receptors to give the total ILCR for a 30-year exposure duration including 6 years as a child and 24 years as an adult.

### 7.2.2.2 Non-Carcinogenic Effects

As mentioned, the HQ is used to characterize the potential health effects resulting from exposure to non-carcinogenic COPC. The HQ compares a receptor's exposure or intake level to the RfD of that COPC (U.S. EPA, 1989a) and is defined as:

$$\text{HQ}_i = \text{CDI}_i / \text{RfD}_i \dots\dots\dots (7-9)$$



where

HQ<sub>i</sub> = hazard quotient for COPC<sub>i</sub> (unitless)  
CDI<sub>i</sub> = chronic daily intake of COPC<sub>i</sub> (mg/kg-d)  
RfD<sub>i</sub> = reference dose of COPC<sub>i</sub> (mg/kg-d)

When using the above equation to estimate non-carcinogenic risk, both the intake and the RfD must refer to exposures of equivalent duration (e.g. chronic, subchronic, or fewer than two weeks). In the risk assessment, exposures associated with construction activities are evaluated using subchronic RfD values, while long-term commercial/industrial activities are assessed using chronic RfD values. HIs are determined by assuming dose additivity for those COPC acting by the same mechanism and inducing the same effects (U.S. EPA, 1986, 1989a). In the case of simultaneous exposure of a receptor to several COPC, an HI is calculated as the sum of the HQs by:

$$HI_t = HQ(COPC_1) + HQ(COPC_2) + \dots HQ(COPC_n) \dots \dots \dots (7-10)$$

where

HI<sub>t</sub> = total hazard index  
HQ(COPC<sub>n</sub>) = individual non-carcinogenic COPC hazard

If the receptor is exposed through multiple pathways, the HI is calculated by first estimating the HQs for the COPC in each exposure pathway and then summing the HQs to calculate a pathway-specific HI. Pathway HIs are then summed to produce a total HI specific to the receptor.

By summing the HQs across pathways and COPC, it is assumed that all COPC exhibit similar toxic properties and that those from different pathways manifest the same toxic effects. This is not usually the case, however, and hence this additive approach produces a conservative estimate. Therefore, where the total HI exceeds unity, the potential non-carcinogenic hazards have been evaluated separately by each target organ system.

### 7.3 RISKS POSED BY RESIDUAL CHEMICAL CONCENTRATIONS

The methodology described above has been used for calculating risks to an adult worker on the MEW Property, an adult construction worker off Site and a child/adult resident off Site. The results of the risk assessment are discussed in the following sections.



### 7.3.1 RISKS TO ON-SITE ADULT WORKER

The risks to an adult worker on Site have been calculated using three different cancer slope factors for TCE, as discussed in Section 4.4. The RME risk calculations for using each slope factor are presented in Tables 7-2 to 7-4. The total HI and ILCR for each RME scenario modeled are presented in Table L below. The CTE risk calculations for using each slope factor are presented in Tables 7-5 to 7-7. The total HI and ILCR for each CTE scenario modeled are presented in Table M below.

**Table L: Summary of RME Health Risks to Adult Worker on MEW Property**

TCE Slope Factor	Total Hazard Index	Incremental Lifetime Cancer Risk
High	0.1	$1 \times 10^{-5}$
Moderate	0.1	$6 \times 10^{-6}$
Low	0.1	$6 \times 10^{-6}$

Note: Incremental lifetime cancer risks have been calculated for an adult worker for a 25-year exposure duration.

**Table M: Summary of CTE Health Risks to Adult Worker on MEW Property**

TCE Slope Factor	Total Hazard Index	Incremental Lifetime Cancer Risk
0.4	0.09	$2 \times 10^{-6}$
0.02	0.09	$1 \times 10^{-6}$
0.006	0.09	$1 \times 10^{-6}$

Note: Incremental lifetime cancer risks have been calculated for an adult worker for a five-year exposure duration.

The RME HI for the adult worker on the MEW Property is estimated to be 0.1. The estimated RME ILCR for the adult worker on the MEW Property ranges from  $1 \times 10^{-5}$  to  $6 \times 10^{-6}$ , depending on which TCE slope factor is used. These ILCRs are based on an exposure duration of 25 years.

The CTE HI for the adult worker on the MEW Property is estimated to be 0.09. The estimated CTE ILCR for the adult worker on the MEW Property ranges from  $2 \times 10^{-6}$  to  $1 \times 10^{-6}$ , depending on which TCE slope factor is used. These ILCRs are based on an exposure duration of 25 years.



### 7.3.2 RISKS TO OFF-SITE ADULT CONSTRUCTION WORKER

The risks to an adult construction worker off Site have been calculated using three different cancer slope factors for TCE, as discussed in **Section 4.4**. The RME risk calculations using each slope factor are presented in **Tables 7-8 to 7-10**. The total HI and ILCR for each RME scenario modeled are presented in **Table N** below. The CTE risk calculations using each slope factor are presented in **Tables 7-11 to 7-13**. The total HI and ILCR for each CTE scenario modeled are presented in **Table N** below.

**Table N: Summary of RME Health Risks to Adult Construction Worker on Wetland Area**

Organic COPC		
TCE Slope Factor	Total Hazard Index	Incremental Lifetime Cancer Risk
0.4	2	$5 \times 10^{-7}$
0.02	2	$4 \times 10^{-7}$
0.006	2	$4 \times 10^{-7}$

Note: Incremental lifetime cancer risks have been calculated for an adult construction worker for a one-year exposure duration.



**Table O: Summary of CTE Health Risks to Adult Construction Worker on Wetland Area**

Organic COPC		
TCE Slope Factor	Total Hazard Index	Incremental Lifetime Cancer Risk
High	0.5	$2 \times 10^{-7}$
Moderate	0.5	$1 \times 10^{-7}$
Low	0.5	$1 \times 10^{-7}$

Note: Incremental lifetime cancer risks have been calculated for an adult construction worker for a one year exposure duration.

The RME HI for the adult construction worker from organic COPC in the wetland area is estimated to be 2. The estimated RME ILCR for organic COPC for the adult construction worker in the wetland area range from  $5 \times 10^{-7}$  to  $4 \times 10^{-7}$ , depending on which TCE slope factor is used. These ILCRs are based on an exposure duration of one year.

The CTE HI for the adult construction worker from organic COPC in the wetland area is estimated to be 0.5. The estimated CTE ILCR for organic COPC for the adult construction worker in the wetland area range from  $2 \times 10^{-7}$  to  $1 \times 10^{-7}$ , depending on which TCE slope factor is used. These ILCRs are based on an exposure duration of one year.

### 7.3.3 RISKS TO OFF-SITE RESIDENTIAL RECEPTOR

The risks to a potential future off-site residential receptor have been calculated using three different cancer slope factors for TCE and for four different scenarios, varying only by the location of the domestic water supply well:

- **Scenario 1.** Risk to future off-Site residents from indoor vapor inhalation, recreational use of the creek and tap water use from Hypothetical Well A;
- **Scenario 2.** Risk to future off-Site residents from indoor vapor inhalation, recreational use of the creek and tap water use from Hypothetical Well B;
- **Scenario 3.** Risk to future off-Site residents from indoor vapor inhalation, recreational use of the creek and tap water use from Hypothetical Well C; and
- **Scenario 4.** Risk to future off-Site residents from indoor vapor inhalation, recreational use of the creek and tap water use from Hypothetical Well D.

The RME risk calculations for a child receptor using each slope factor and hypothetical well location are presented in Tables 7-14 to 7-25. The RME risk calculations for an adult receptor using each slope factor and hypothetical well location are presented in Tables 7-26 to 7-37. The



CTE risk calculations for a child receptor using each slope factor and hypothetical well location are presented in **Tables 7-38 to 7-49**. The CTE risk calculations for an adult receptor using each slope factor and hypothetical well location are presented in **Tables 7-50 to 7-61**.

Summaries of the risk calculation results for the off-Site resident for all four hypothetical well scenarios are presented in **Tables 7-62 and 7-63**. The highest risk occurs for the Hypothetical Well D scenario. As discussed in **6.2.1**, the tap water concentrations for Hypothetical Well D are equal to the maximum predicted concentrations in Hypothetical Wells A and B. The Hypothetical Well D scenario therefore represents worst case conditions for the off-Site resident. The lowest risk occurs for Hypothetical Well C. This well is located furthest from the Site and on the boundary of the modeled organic COPC plume. The calculated risks for Hypothetical Wells C and D therefore represent the total range of calculated risks for the off-Site resident. The total HI and ILCR for RME for these two scenarios are presented in **Tables P and Q**, respectively. The percentage contribution to risk from each pathway is given in **Table R**.

**Table P: Summary of RME HI to Off-Site Resident**

	Hypothetical Well C	Hypothetical Well D
Child	0.06	124
Adult	0.03	53

**Table Q: Summary of RME ILCR to Off-Site Resident**

	Hypothetical Well C			Hypothetical Well D		
TCE Slope Factor	High	Moderate	Low	High	Moderate	Low
Total (Child & Adult)	$2 \times 10^{-6}$	$4 \times 10^{-7}$	$3 \times 10^{-7}$	$1 \times 10^{-2}$	$1 \times 10^{-2}$	$1 \times 10^{-2}$

Note: \*Incremental lifetime cancer risks have been calculated for off-Site resident for a 30-year exposure duration, including 6 years as a child and 24 years as an adult.

The estimated RME ILCR for organic COPC for the residential receptor ranges from  $3 \times 10^{-7}$  to  $1 \times 10^{-2}$ , depending on the location of the hypothetical well and the TCE slope factor used. These values have been calculated for a 30-year exposure duration, including 6 years as a child and 24 years as an adult. The organic ILCR is highly dependent on the location of the hypothetical well. Hypothetical Well C located on the edge of the modeled organic COPC plume has significantly lower predicted concentrations of COPC than Hypothetical Well D and thus has a lower calculated risk. The calculated ILCR for organic COPC for the off-Site resident using Hypothetical Well C ranges from  $3 \times 10^{-7}$  (low TCE carcinogenic slope factor) to  $2 \times 10^{-6}$  (high TCE carcinogenic slope factor).



**Table R: RME Percentage Contribution to Risk for Off-Site Resident**

Scenario	% Contribution to Total Exposure							
	Hypothetical Well A		Hypothetical Well B		Hypothetical Well C		Hypothetical Well D	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
<b>Organic COPC</b>								
Inhalation – vapor intrusion	0.02	0.50	0.01	0.09	98.37	95.45	0.01	0.05
Ingestion – tap water	11.14	13.00	10.68	13.40	0.01	0	11.25	13.05
Dermal contact – tap water	69.52	24.72	71.66	27.68	0.04	0	69.44	24.57
Inhalation – tap water	19.32	62.23	17.65	58.83	0.01	0.010	19.30	62.33
Ingestion – creek water	0	0	0	0	0.27	0.16	0	0
Dermal contact – creek water	0	0	0	0	1.30	4.38	0	0
Total	100	100	100	100	100	100	100	100

The total RME HI for organic COPC is estimated to be 0.06 for a child resident and 0.03 for an adult resident.

A summary of the risk results for each organic COPC with an HI in excess of 0.1 and an ILCR in excess of  $1 \times 10^{-6}$  is presented in **Table S** for the Hypothetical Well D scenario.



**Table S: Summary of HI and ILCR for Organic COPC, Hypothetical Well D**

COPC	ILCR	COPC	HI	Target Organ
1,1,2,2-Tetrachloroethane	1.71E-06	Chlorobenzene	75	Liver
1,2-Dichloroethane	2.23E-06	1,2,4-Trichlorobenzene	18	Adrenal Gland
Bromodichloromethane	2.33E-06	Aroclor-1254	12	Skin, Immune System, Liver
3,3-Dichlorobenzidine	2.79E-06	Trichloroethene	7.2	Liver, Kidney and Developing fetus
Aroclor-1221	3.07E-06	Benzene	4.2	Blood, Immune System
Aroclor-1232	3.71E-06	Bis(2-ethylhexyl)phthalate	3.1	Liver, Kidney
Vinyl Chloride	4.62E-06	Naphthalene	1.3	Blood, Liver, Kidney, Nervous System, Reproductive System
Hexachloro-1,3-Butadiene	6.60E-06	Hexachloro-1,3-Butadiene	0.73	Kidney
Aroclor-1016	8.18E-06	Hexachlorobenzene	0.30	Liver
Aroclor-1248	8.76E-06	Nitrobenzene	0.26	Liver, Kidney
2,4-Dinitrotoluene	1.20E-05	1,4-Dichlorobenzene	0.24	Blood, Liver and Kidney
Benzo(k)fluoranthene	1.30E-05	2,4,6-Trichlorophenol	0.21	No Data
Aroclor-1242	1.53E-05	Aroclor-1016	0.21	Fetus (low birth weight)
Aroclor-1254	2.62E-05	1,3-Dichlorobenzene	0.18	Liver
2,6-Dinitrotoluene	2.65E-05	4,6-Dinitro-2-Methyl Phenol	0.13	Eye
Benzo(a)anthracene	3.55E-05	Chloroform	0.11	Liver
Benzo(b)fluoranthene	3.80E-05	Pentachlorophenol	0.11	Liver, Kidney
Indeno(1,2,3-cd)Pyrene	4.70E-05			
Bis(2-ethylhexyl)phthalate	5.77E-05			
Chloroform	7.35E-05			
Pentachlorophenol	9.58E-05			
1,4-Dichlorobenzene	1.11E-04			
Hexachlorobenzene	1.72E-04			
Benzene	2.25E-04			
Benzo(a)pyrene	5.19E-04			
Trichloroethene	5.48E-04			
Bis(2-Chloroethyl) Ether	5.79E-04			
N-Nitrosodi-n-propylamine	7.96E-04			
Tetrachloroethene	9.12E-04			
Dibenzo(a,h)Anthracene	1.84E-03			
Aroclor-1260	5.91E-03			



Table S shows that there are a number of target organs that would likely be affected by the COPC giving HIs of greater than 0.1.

The total HI and ILCR for CTE for off-Site residents using Hypothetical Wells C and D are presented in Tables U and V, respectively.

**Table T: Summary of CTE HI to off-Site resident**

		Hypothetical Well C	Hypothetical Well D
Child	Organic COPC	0.04	75
Adult	Organic COPC	0.02	20

**Table U: Summary of CTE ILCR to Off-Site Resident**

TCE Slope Factor	Hypothetical Well C			Hypothetical Well D		
	High	Moderate	Low	High	Moderate	Low
Total (Child & Adult)	$5 \times 10^{-7}$	$1 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-3}$	$2 \times 10^{-3}$	$2 \times 10^{-3}$

Note \*Incremental lifetime cancer risks have been calculated for off-Site resident for an 11-year exposure duration, including 2 years as a child and 9 years as an adult

The estimated HI for CTE for organic COPC is up to 0.04 for Hypothetical Well C scenario and 75 for the Hypothetical Well D scenario. The estimated total ILCR for CTE from organic COPC for the off-Site residents ranges from  $5 \times 10^{-7}$  to  $2 \times 10^{-3}$ , depending on which Hypothetical Well is used.

### 7.3.4 RISKS TO OFF-SITE TRESPASSER

The risks to the off-Site trespasser have been assessed through the off-Site resident scenarios. The dermal contact and incidental ingestion with creek water are relevant to this receptor. The risk for these scenarios is shown for the adult and child receptor in Tables 7-14 to 7-61. These are summarized in Tables V and W.

**Table V: Summary of HI to Off-Site trespasser**

	RME	CTE
Child	0.003	0.001
Adult	0.002	0.0006



**Table W: Summary of ILCR to Off-Site Trespasser**

TCE Slope Factor	RME			CTE		
	High	Moderate	Low	High	Moderate	Low
<b>Total (Child &amp; Adult)</b>	$3 \times 10^{-8}$	$3 \times 10^{-8}$	$3 \times 10^{-8}$	$5 \times 10^{-9}$	$5 \times 10^{-9}$	$4 \times 10^{-9}$

RME incremental lifetime cancer risks have been calculated for the off-Site trespasser for a 30-year exposure duration, including 6 years as a child and 24 years as an adult. CTE incremental lifetime cancer risks have been calculated for off-Site trespasser for an 11-year exposure duration, including 2 years as a child and 9 years as an adult.

## 7.4 EVALUATION OF NON-CANCER RISK BY TARGET EFFECT

For exposure scenarios where the resulting total HI exceeds unity, an additional evaluation of the potential for non-carcinogenic hazards has been performed. In accordance with RAGS Guidance (U.S. EPA, 1998), the potential for non-carcinogenic hazards has been evaluated separately for each target organ system.

The RME HI for both the off-Site resident scenario (Hypothetical Well D – worst case scenario) and the off-Site worker scenario exceeds 1. The HI by target organ for each of these exposure scenarios is summarized below:

**Table X: Summary of HI by Target Effect – Off-Site Resident (Hypothetical Well D)**

Target Organ/Effect	HI	Target Organ/Effect	HI
Liver	118	Eye	0
Adrenal Gland	20	Nervous System	0
Immune System	16	Nasal	0
Kidney	13	Respiratory	0
Skin	12	Mortality	0
Blood	7	Bile Duct	0
Developing Fetus	7	Lung	0
Central Nervous System	8	Systemic Tissue	0
Endocrine system	7	Lymphoid System	0
Bone Marrow	4	Thymus	0
Reproductive System	1		

Based on the above table, it can be concluded that there is an unacceptable level of risk to the off-Site resident, specifically to the following target organs where the HI exceeds 1: liver, adrenal gland, immune system, kidney, skin, blood, developing fetus, central nervous system, endocrine system, bone marrow, and reproductive system.



**Table Y: Summary of HI by Target Effect – Off-Site Worker**

Target Organ/Effect	HI	Target Organ/Effect	HI
Liver	1.5	Central Nervous System	0.0
Kidney	0.6	Adrenal Gland	0.0
Fetus (low birth weight)	0.6	Immune System	0.0
Blood	0.0	Intestinal Epithelium	0.0
Skin	0.0	Bile Duct	0.0
Hematopoietic System	0.0	Eye	0.0
Immune System	0.0	Lung	0.0
Reproductive System	0.0	Mortality	0.0
Lymphoid System	0.0	Respiratory	0.0
Thymus	0.0	Systemic Tissue	0.0

Based on the above table, it can be concluded that there is an unacceptable level of risk to the off-Site construction worker, specifically to the liver, as the HI for the target organ exceeds 1.



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## 8 UNCERTAINTY ANALYSIS

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The assumptions, procedures, and parameters used in this risk assessment are subject to various degrees of uncertainty. Uncertainty is inherent in the risk assessment process. The uncertainty analysis provides an understanding of the limitations in interpretation of the quantitative estimates of risk presented in this health risk assessment.

### 8.1 SAMPLE COLLECTION AND ANALYSIS

Environmental sampling and analysis error can stem from improper sample collection and handling procedures, inadequate sample numbers, laboratory analysis errors, and the statistical biases in the sampling due to heterogeneity of Site soil. The use of standard techniques such as the collection of duplicates, and the use of triplicate and method blanks can be used to reduce the likelihood of errors. Errors in data analyses can occur from the simplest tabulation and typographical errors to complex interpretational errors. Matrix interferences due to the presence of high concentrations often raise the detection limits of other chemicals in the analytical procedure and introduce uncertainty in the method of data analyses.

The quantification of potential exposures is based on statistical summaries of environmental sampling results. For the on-Site worker, 95 percent UCL groundwater concentrations were used as the source term in the vapor modeling for this receptor. To take account of uncertainty in the groundwater modeling and to reflect the fact that current off-Site concentrations may be influenced by historical on-Site groundwater concentrations, the maximum recorded on-Site concentrations of organics have been used as the source term in the groundwater modeling. One-half the MDL of non-detectable chemicals has been used as the source term in the groundwater modeling.

Bis(2-ethylhexyl) phthalate has been detected sporadically in a number of groundwater samples, as well as field and equipment blanks. In total, bis(2-ethylhexyl) phthalate was detected in 87 out of 248 samples. Bis(2-ethylhexyl) phthalate was also detected in 53 corresponding field and/or equipment blanks. This chemical is used as a plasticizer and it is likely that its occurrence within samples and blanks is due to the use of plastic sampling equipment. This chemical may be also be present in field blanks as water typically provided by the laboratory for subsequent submission as blank samples is often stored in plastic containers. Data with a "B" qualifier was included in the risk assessment only if the concentration in the sample exceeded ten times the maximum concentration reported in the blank. Bis(2-ethylhexyl)



phthalate detected in samples at concentrations exceeding ten times the maximum concentration reported in the blank on two occasions. Therefore, 51 bis(2-ethylhexyl)phthalate detection were not considered further in the risk assessment. The inclusion of this chemical as a COPC in this risk assessment is considered conservative and may result in the over estimation of risk to potential receptors, as it is not believed that bis(2-ethylhexyl)phthalate is present in groundwater beneath the Site.

Non-detected COPC have been selected by comparison of the maximum MDL with screening levels based on the U.S. EPA Region 9 PRG values. The inclusion of non-detected constituents as COPC may result in an over- or under- estimation of the actual risk. If the actual concentration of any given COPC is greater than one-half the MDL, the risk will be underestimated. Alternatively, if the actual concentration is less than one-half the MDL the risk will be over-estimated.

## 8.2 EXPOSURE PARAMETERS

Exposure scenarios that incorporate the most likely Site-specific exposure pathways and represent the greatest potential for exposure were selected to evaluate potential exposure. Conservative assumptions consistent with State and Federal guidelines were used to quantitatively define the RME exposure scenarios. The methods and procedures contribute to an overall overestimation of potential exposure. Numerous conservative exposure assumptions were made in selecting the reasonable maximum exposure parameters used in this assessment. Duration, frequency, and other input parameters were selected to overestimate exposure to the potentially exposed individual and are not an accurate portrayal of actual exposure. For example, an exposure duration of 24 hours per day was assumed for the residential receptor for the indoor inhalation of air. This is conservative as it is considered unlikely that a residential receptor would spend 24 hours a day inside, 350 days per year. The quantitative effect of these uncertainties contributes to an overall overestimate of potential health risks.

Perhaps, the most conservative assumptions have been made in quantitatively defining the RME off-Site worker exposure scenario. It has been assumed that a typical construction worker could be exposed to groundwater at the Site 250 days a year for 12 hours per day. Although it is likely that a typical construction project could last an entire year, the period of time that exposure to groundwater would be likely would only be a fraction of the overall construction period. Excavations and trenches would typically only be open for short periods of time and would most likely be advanced using mechanical means. Furthermore, it is possible that shallow groundwater may not be encountered during construction activities and in the event

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that groundwater is present, it is likely that a de-watering strategy would be implemented. As this exposure scenario assumes dermal contact with, and incidental ingestion of, shallow groundwater, the quantitative effect of these uncertainties contributes to an overestimation of potential health risks to the off-Site worker.

Exposure parameters have also been selected for CTE scenarios. These parameters have deliberately been chosen to estimate average conditions. The use of average conditions may under estimate the risk to some receptors and therefore the use of RME is considered more appropriate for making risk decisions.

## **8.3 MODELING RESULTS**

### **8.3.1 GROUNDWATER MODELING**

The groundwater fate and transport modeling was conducted to predict concentrations of organic COPC in groundwater off Site for use in the risk quantification. There are a number of uncertainties within the model that affect the likelihood of the predicted concentrations occurring. These are discussed below:

#### **8.3.1.1 Model Code**

POE concentrations for organic COPC have been predicted using an EPM groundwater model. The EPM model code Modflow was selected to do this for several reasons:

- Modflow is capable of modeling several layers with multiple boundary conditions;
- Modflow is a widely used and accepted EPM model; and
- Modflow allows groundwater flow and contaminant transport to be simulated.

The assumption of EPM conditions is a simplification of actual groundwater flow at the Site. The alluvial and loess deposits are both porous media and therefore flow through these deposits is best represented using an EPM model. However, groundwater flow through the limestone occurs primarily through fractures. The fracture network modeling code Fracman has been used to model groundwater and contaminant transport through the fractures in the limestone. This code cannot be used for modeling EPM flow or transport in the loess or alluvial deposits and therefore is not sufficient by itself to estimate POE concentrations.

The results of the fracture network modeling have been compared with those from the EPM model to assess the validity of the latter for simulating transport through the fractured limestone. This process has shown that the maximum off-Site concentrations predicted by the



EPM model are similar to those predicted by the fracture network model and therefore the EPM model is considered suitable for estimating POE concentrations.

There is uncertainty over the exact locations and connectivity of fractures at the Site. Fracture exposure mapping and borehole core data have been used to define fracture statistics and these have been used to create the fracture network model. This model has shown various possible fracture pathways from the MEW Property that COPC could travel. The highest off-Site concentrations are predicted to occur in fractures that are connected to and down hydraulic gradient from fractures at the MEW Property. Geophysics has been used to locate off-Site monitoring wells within such fractures. However, it is possible that key flow fractures have been missed and therefore it is possible that the off-Site wells do not truly represent worst-case off-Site concentrations. The EPM model predicts higher concentrations than those observed in off-Site wells and is therefore considered a better methodology for predicting worst-case off-Site POE concentrations than sample data.

As discussed above, the EPM model is considered suitable for representing maximum off-Site concentrations for use in the risk calculations but there remains uncertainty over exactly where these maximum concentrations would occur. Although the EPM model can reasonably predict COPC concentrations in a simulated fracture and model results are valid for scales of evaluation that are likely to include one or more fractures, the exact occurrence, location and geometry of fractures in the field are not known. Therefore, model results can be used to assess worst-case risk to hypothetical receptors (by wells modeled as being installed in simulated fractures); however, the results can not be used at the scale necessary to precisely locate wells for either remediation or water supply purposes. The POE locations have been selected where the off-Site maximum concentrations are predicted to occur by the groundwater model. It should be noted that these locations may not be optimal, *i.e.* the maximum concentrations may occur in slightly different locations than those predicted by the model. Furthermore, the plume shape predicted by the model may not be accurate. This uncertainty does not affect the validity of the EPM model for predicting POE concentrations but should be considered if using the results of the modeling for other purposes.

#### **8.3.1.2 Groundwater Flow Parameters**

The groundwater flow component of the model was calibrated to observed groundwater levels. This involved adjustment of hydraulic conductivity and recharge until the modeled groundwater heads were an adequate representation of observed heads. Calibration was found possible with a range of values for these parameters. To ensure that a conservative approach

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was taken the calibrated model that represented worst-case conditions for the off-Site migration of COPC was adopted for the chemical transport modeling. This model includes a high transmissivity fracture that runs directly from the source area in the south east corner of the Property to the wetland area and uses highest likely values of recharge and hydraulic conductivity.

This model has been developed to represent reasonable worst-case conditions for chemical migration from the Site. The high transmissivity fracture leading from the Property to the wetland area effectively provides a conduit for groundwater flow, channeling recharge through the source zone and allowing chemicals to rapidly migrate to the wetland area. In reality, this is unlikely to occur. Fracture mapping has shown that fractures are relatively evenly spaced, in close proximity to each other (5 m in the weathered zone) and that there are two approximately orthogonal sets. As a result, COPC migration is likely to become distributed throughout a number of fractures before reaching the wetland area. This has been demonstrated by the fracture modeling which has shown that COPC are likely to be distributed between a number of fractures within 600 feet (180 m) of the MEW Property. This result suggests that dispersion may be underestimated in the EPM model. However, given the uncertainty involved in modeling complex fracture network systems, the assumption of one transmissive fracture leading directly from the Site is considered suitable for estimating RME POE concentrations.

### **8.3.1.3 Chemical Transport Parameters**

The difficulties inherent in obtaining Site-derived values for many of the chemical transport parameters, has meant that literature values have had to be used. To account for the uncertainty involved in using literature values, worst case estimates have been adopted. For the non-detectable organic COPC the conservative assumption has been made that biodegradation does not occur. Sensitivity analysis has shown that the modeled concentrations of COPC are highly dependent on these parameters, especially biodegradation half-life. Use of more likely values for this parameter would result in significantly lower concentrations of COPC being predicted beneath the wetland area.

The assumption has been made that retardation does not occur within the weathered or intermediate zones of the limestone. While this is reasonable for the intermediate limestone where fractures are mostly open, it may be overly conservative for the weathered zone, where the fractures are mostly infilled with surficial deposits. Sorption of COPC onto these deposits could significantly retard COPC and result in a significant reduction in the predicted concentrations off-Site.



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Finally, the chemical transport modeling uses the maximum observed on-Site concentrations as the source term. Data from other wells located in the source zone show that this is likely to be an overestimate of the actual average concentration within the source area. The modeled flux of COPC from the source zone is therefore likely to be higher than that which occurs in reality. However, given the uncertainty involved in modeling complex fracture network systems, the use of maximum concentrations in the groundwater model as the source term is considered suitable for estimating RME POE concentrations.

### 8.3.2 VAPOR MODELING

The Johnson-Ettinger model has been used to conduct the vapor modeling. There are a number of uncertainties within this model that must be considered when evaluating the results of the risk assessment.

Firstly, the source concentrations in groundwater used for the modeling are likely to be conservative. The source concentrations used for the on-Site worker are based on the 95<sup>th</sup> percentile UCL concentrations in the well where the highest concentration of each COPC has been observed. The concentrations detected in neighboring wells show that these high concentrations are limited in extent and that the average concentration in groundwater beneath the footprint of a commercial building is likely to be lower. The concentrations in groundwater used for modeling indoor air concentrations in a house off Site are based on the groundwater modeling results. As discussed in Section 8.3.1, there is uncertainty involved with the groundwater modeling, but conservative assumptions have been selected to try and ensure that the model results are also conservative.

Secondly, the Johnson-Ettinger model does not model attenuation of COPC within the source zone. Most significantly, aerobic biodegradation within the vadose zone beneath the house or building is likely to significantly reduce the flux of COPC into the building.

### 8.3.3 DERMAL EXPOSURE

Dermal uptake from contact with impacted groundwater or surface water has been estimated using U.S. EPA recommended methods. These methods require dermal exposure uptake factors, such as the skin permeability coefficient, to be estimated for each COPC. For a number of COPC these parameter values were not available. The estimation of dermal uptake has therefore not been possible for these COPC. The exclusion of the dermal uptake pathways for these COPC will tend to increase the likelihood of underestimating risk.

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## 8.4 TOXICOLOGICAL DATA

Several aspects of the toxicological data employed in this health risk assessment contain a high degree of uncertainty that affects estimates of potential risk. These uncertainties arise in three primary areas. First, CSFs used in this assessment were estimates representing the 95 percent UCL. This assumption means actual risks are likely to be lower than the risk estimates calculated in this assessment. Use of the 95 percent UCL CSF values is consistent with the approach of determining risk as indicated by the U.S. EPA.

Second, results of animal studies are often used to predict the potential human health effects of a chemical. Extrapolation of toxicological data from animal tests is one of the largest sources of uncertainty in the human health risk evaluation process. There may be important but unidentified differences in uptake, metabolism, distribution, and elimination of chemicals between test species and humans. Animal studies are usually conducted under high-dose conditions, whereas humans are rarely exposed to such high doses. The dose level itself may be responsible for the observed carcinogenic effects. Animal life expectancies tend to be less than 2 years, and assumed human life expectancy is 70 years.

In the absence of pathway-specific toxicological criteria, surrogate values were used in an effort to quantify the risk of potential adverse health effects. This type of surrogate-based calculation will provide estimates of risk that reflect a high degree of uncertainty. Although efforts have been made to use conservative assumptions in performing surrogation, the net effect to an estimate of risk is unknown.

Third, the issue of bioavailability must be explored. It is typically assumed that 100 percent of the chemicals to which a hypothetical subject is exposed to in the environment are absorbed via the routes of exposure. There is a growing body of evidence which suggests that this conservative assumption is not always correct. Toxicological testing of chemicals typically involves the use of purified forms of the chemical, providing a significantly more "severe" exposure than is found in environmental exposures. Therefore it is important to note that chemicals in soil will be absorbed by the body at lower rates than pure forms of the chemical. Risk characterization estimates based on the assumption of 100 percent bioavailability of chemicals in the environment, therefore, tend to overestimate the magnitude of the risk by orders of magnitude. The recently completed report by the Congressional Commission on Risk Assessment and Risk Management (1996), notes that "Agencies should continue to move away from using the hypothetical maximally exposed individual" to evaluate whether a risk exists, toward more realistic assumptions based on available scientific data, as they have done in



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recent analyses. We recommend use of analytic methods that, when data permit, combine the many characteristics of probable exposure into an assessment of the overall population's exposures."

It should be noted that there is insufficient human or animal data to derive toxicological reference values for all COPC for all pathways. Very little data on the dermal exposure pathway exists and as a result there are no dermal reference doses or cancer slope factors available from the toxicological sources used for this assessment. In the absence of this data, extrapolation from oral reference doses and cancer slope factors has been used to derive dermal toxicological values. Route to route extrapolation has not been used between the oral and inhalation pathways due to the large uncertainty involved. As shown on **Tables 4-1 through 4-4** toxicological reference values were not available for select COPC. The absence of this data will tend to increase the possibility of underestimating risk.

COPC have been selected by comparison of the maximum measured groundwater concentrations or the maximum MDL with screening levels based on the U.S. EPA Region 9 PRG values. There are four chemicals where no PRG or similar values were available for use as screening toxicity values. These compounds have been conservatively selected as COPC; however, quantitative evaluation is not possible due to lack of adequate toxicity data. The inability to evaluate these chemicals quantitatively in the risk assessment could result in the potential underestimation of risk associated with exposure to any concentrations of these chemicals that may be present below the detection limits.

## **8.5 UNCERTAINTIES ASSOCIATED WITH COMBINATIONS OF CONSERVATIVE ASSUMPTIONS**

Uncertainties from different sources may be compounded in the risk assessment methodology. This evaluation followed Federal agency guidelines by consistently incorporating conservative assumptions in calculating risk. The overall effect of using conservative assumptions in each step of the risk assessment is likely to result in an overestimation of potential risk. Thus, evaluation results must be reviewed with an understanding of the uncertainties involved and how they effect risk estimations. The quantitative effect of the conservative nature of the uncertainties inherent in the methodology and procedures is emphasized by the U.S. EPA in the following statement: "The ... risk is characterized as an upper-bound estimate, i.e., the true risk to human, while not identifiable, is not likely to exceed the upper-bound estimate and in fact may be lower". Findings of insignificant risk may reflect conditions close to reality; however,

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findings of measurable risk may reflect conditions that result from the conservative nature of the evaluation.



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## 9 CONCLUSIONS

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The human health risk assessment has been conducted to evaluate the likely risks posed by COPC in groundwater at the MEW Property to future receptors. The risk assessment has been conducted using conservative assumptions to ensure that the calculated risks are higher than those that would likely occur (**Section 8**). This helps to ensure that any risk reducing mitigation measures deemed necessary will be protective of all likely future receptors.

The future land-uses selected were residential for the wetland area and commercial for the MEW Property. A CEM was developed based on these land-uses. The adult worker receptor was selected to represent RME on the MEW Property and the adult construction worker and child/adult resident were selected to represent RME off-Site. The risk to these receptors is summarized below.

### ***Adult Worker on MEW Property***

A deed restriction will be applied to the MEW Property to ensure that groundwater beneath the Property cannot be extracted for use. Pathways considered complete for the adult worker were:

- Inhalation of volatilized COPC that have migrated from subsurface through floor of building.

Risk quantification was used to characterize the risks to this receptor arising from this pathway. The total HI for this receptor for RME from organic COPC is estimated to be 0.1. This is below the acceptable limit of 1 and it is therefore concluded that there is no significant non-carcinogenic risk to future workers at the MEW Property.

The carcinogenic risk to this receptor was quantified using a range of cancer slope factors for TCE, as recommended by the U.S. EPA. This resulted in a RME ILCR for organic chemicals that ranged from  $1 \times 10^{-5}$  to  $6 \times 10^{-6}$ . The estimated total RME ILCRs are within the acceptable risk management range.

### ***Off-Site Construction Worker***

Pathways considered complete for the off-Site adult construction worker were:

- Dermal contact with groundwater while involved in excavation activities; and
- Incidental ingestion of groundwater while involved in excavation activities.

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Risk quantification was used to characterize the risks to this receptor arising from this pathway. The HI for organic COPC for this receptor for RME is estimated to be 2. This is above the acceptable limit of 1 and it is therefore concluded that there could be a significant non-carcinogenic risk from organic COPC to future construction workers in the wetland area.

The estimated ILCRs for organic COPC for this receptor for RME are between  $4 \times 10^{-7}$  and  $5 \times 10^{-7}$ . The estimated total RME ILCRs are within the acceptable risk management range. It is therefore concluded, that there is no significant carcinogenic risk to future construction workers in the wetland area from organic COPC.

### **Off-Site Resident**

Pathways considered complete for the off-Site resident were:

- Inhalation of volatilized COPC that have migrated from subsurface through floor of house;
- Inhalation of volatilized COPC from tap water obtained from a domestic water supply well;
- Ingestion of tap water obtained from a domestic water supply well;
- Dermal contact with tap water obtained from a domestic water supply well;
- Incidental ingestion of groundwater (that has discharged to surface water); and
- Dermal contact with groundwater (that has discharged to surface water).

Risk quantification was used to characterize the risks to this receptor arising from these pathways. The total HI for organic COPC for this receptor is estimated to range from 0.06 to 124. The calculated ILCR for organic COPC for RME ranges from  $3 \times 10^{-7}$  to  $1 \times 10^{-2}$ . The highest risk occurs when using the modeled worst case off-Site concentrations for tap water (Hypothetical Well D). The lowest risk occurs when using the predicted concentrations for tap water from Hypothetical Well C located on the edge of the modeled organic COPC plume. The calculated total HI and ILCR for organic COPC for the off-Site resident exceed the acceptable risk management limits of 1 and  $1 \times 10^{-4}$ , respectively for the worst case scenario (Well D). These ILCR values are based on an exposure duration of 30 years, including 6 years as a child and 24 years as an adult. From these results, it can be concluded that there could be a significant risk to future off-Site residents who use impacted groundwater for water supply. However, the risk to future off-Site residents who do not use impacted groundwater for water supply is acceptable.

These results show that there could be a significant risk to off-Site residents from organic COPC. This risk is primarily due to the use of impacted groundwater for water supply. Provided that



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impacted groundwater is not used as water supply, the risk to this receptor from organic COPC is not likely to be significant.

### ***Off-Site Trespasser***

Pathways considered complete for the off-Site trespasser were:

- Incidental ingestion of groundwater (that has discharged to surface water); and
- Dermal contact with groundwater (that has discharged to surface water).

The risks to this receptor have been assessed as part of the risk quantification for the off-Site resident. The total HI for this receptor for RME from organic COPC is estimated to be 0.003. This is below the acceptable limit of 1 and it is therefore concluded that there is no significant non-carcinogenic risk to future off-Site trespassers.

The carcinogenic risk to this receptor was quantified using a range of cancer slope factors for TCE, as recommended by the U.S. EPA. This resulted in a RME ILCR for organic chemicals of  $3.0 \times 10^{-8}$ . The estimated total RME ILCR is within the acceptable risk management range.

### ***Summary***

The results of the risk assessment have demonstrated that the risk to adult workers at the MEW Property is unlikely to be significant. This is based on the assumption that a deed restriction is applied to the Property to prevent the usage of groundwater beneath it.

Groundwater fate and transport modeling has indicated that the groundwater plume containing COPC could extend off Site to the southeast of the MEW Property beneath the wetland area. The risk assessment has shown that use of the potentially impacted groundwater beneath the wetland area could present a significant risk to residential receptors and dermal contact with and incidental ingestion of potentially impacted groundwater could present a significant risk to off-Site construction workers.

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## 10 CLOSURE/LIMITATIONS

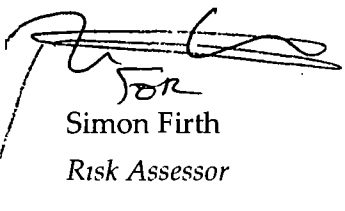
This report has been prepared for the exclusive use of MEW Site Trust Fund Donors as it pertains to the MEW Site in Cape Girardeau, Missouri. Our services have been performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable, qualified environmental consultants practicing in this or similar locations. No other warranty, either expressed or implied, is made as to the professional advice included in this report. These services were performed consistent with our agreement with our client.


Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We do not warrant the accuracy of information supplied by others or the use of segregated portions of this report.

The purpose of a geologic/hydrogeologic/contaminant/health assessment is to reasonably characterize environmental conditions or risks at the Site. In performing such an assessment, it is understood that no investigation is thorough enough to describe all conditions of interest at a given Site. If conditions have not been identified during the investigation, such a finding should not, therefore, be construed as a guarantee of the absence of such conditions at the Site, but rather as the result of the services performed within the scope, limitations, and cost of the work performed.

In regard to geologic/hydrogeologic/contaminant/risk assessment, our professional opinions are based in part on interpretation of data from discrete sampling locations. It should be noted that actual conditions at locations that have not been sampled may differ from those interpreted from sampled locations.

Respectfully submitted,  
**KOMEX**

  
Simon Firth  
Risk Assessor

  
Jon Rohrer  
Project Hydrogeologist

cc: distribution list attached



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TABLE 3-1  
POST REMEDIATION GROUNDWATER ANALYTICAL RESULTS FOR DETECTED ORGANICS  
MISSOURI ELECTRIC WORKS

Well ID	Compound	1,1,1-TCA	TCE	PCE	1,1-DCA	1,1-DCE	1,2-DCE, Total	Benzene	Bromo-dichloro-methane	Chloro-benzene	Chloro-methane	Methylene Chloride	Toluene	Chloroform	Acetone	1,2,4-TCB	1,2-DCB	1,3-DCB	1,4-DCB	Bis(2-chloroethyl) ether	Butyl benzyl phthalate	2-Chloro-phenol	N-Nitrosodi-n-propylamine	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl phthalate	Bis(2-ethylhexyl) phthalate	Naphthalene	Phenol	Aroclor 1260 Unfiltered	Aroclor 1260 Filtered	
		8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8082	8082	
		Sample Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
MW-11(DUP)	08/08/02	<5.0	<5.0	<5.0	4 J	<5.0	8	<5.0	<5.0	39	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	6 J	<10	<10	<10	<10	<10	<10	<10	<10	<10	0.69	<0.50
MW-11	10/31/02	<5.0	3 J	<5.0	3 J	<5.0	6	<5.0	<5.0	<5.0	<5.0	2 J	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11(DUP)	10/31/02	<5.0	3 J	<5.0	3 J	<5.0	6.4	<5.0	<5.0	<5.0	<5.0	2 J	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11 (EPA S)	10/31/2002	—	3.2	1 U	2.8	1 U	5.4	1 U	—	1.9	<5.0	2 J	<5.0	<5.0	—	—	5 U	5 U	5 U	—	<10	<10	<10	<10	—	—	—	<10	<10	<10	0.59	0.20 U
MW-11	02/05/03	<5.0	2 J	<5.0	2 J	<5.0	3 J	<5.0	<5.0	4 J	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11	05/06/03	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11	08/13/03	<5.0	2.0 J	<5.0	2.1 J	<5.0	3.8 J	<5.0	<5.0	5.0 J	2.3 J	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—
MW-11	09/14/03	<5.0	4.6 J	<5.0	3.7 J	<5.0	8.9	<5.0	<5.0	20	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—
MW-11	10/28/03	<5.0	5.6	<5.0	2.7 J	<5.0	9.8	<5.0	<5.0	2.7 J	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—
MW-11	02/03/04	<5.0	5.4	<5.0	3.2 J	<5.0	7.7	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11	05/19/04	<5.0	3.4 J	<5.0	2.8 J	<5.0	7.7	<5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11	08/11/04	<5.0	8.9	<5.0	3.2 J	<5.0	12	<5.0	<5.0	1.5 J	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11	11/17/04	<5.0	8.2	<5.0	2.9 J	<5.0	8.5	<5.0	<5.0	3.0 J	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.50	—	
MW-11A	06/22/00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<1.4	<1.0	
MW-11A	06/22/00	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19	6.3	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	
MW-11A *	09/27/00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<1.0	<1.0	
MW-11A	09/29/00	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	04/25/01	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	07/26/01	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	10/24/01	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	01/24/02	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	05/09/02	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	08/08/02	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	11/01/02	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	2 J	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	02/04/03	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	05/06/03	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	09/04/03	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1.0	<1.0	
MW-11A	10/29/03	<5.0	<5.0	<5.0	<5.0																											



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**TABLE 3-1**[illegible]

Notes:

- 1- TCA = trichloroethane
- 2- TCE = trichloroethene
- 3- PCE = tetrachloroethane
- 4- DCA = dichloroethane
- 5- DCE = dichloroethene
- 6- TCB = trichlorobenzene
- 7- DCB = dichlorobenzene
- 8- µg/L = micrograms per liter
- 9- < \$ 0 = compound not detected at or above stated reporting limit
- 10- \* = pre-purge sample
- 11- \*\* = Result not considered reliable - laboratory communication reports that the result may be attributed to laboratory cleaning agents - laboratory blank not available
- 12- (EPA S) = sample collected by EPA and analyzed by an independent laboratory (original data not available for review)
- 13- (DUP) = duplicate sample
- 14- MW-11A sampled on 06/22/00 = Laboratory report for this sample tagged as Matrix Spike/Matrix Spike Duplicate Results not considered reliable
- 15- J = compound not detected at quantitation limit
- 16- B = compound detected in associated blank (if sample concentration is greater than 10 X concentration detected in blank denoted with "B" and used in risk assessment)
- 17- "-" = not analyzed



**TABLE 3-2**

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**TABLE 3-2**

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**TABLE 3-2**

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MISSOURI ELECTRIC WORKS

Well ID	Sample Date	Compound	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-chloroethoxy)methane	Bis(2-chloropropyl)ether	Bromoform	Bromomethane	Carbazole	Carbon tetrachloride	Chloroethane	Chrysene	cis-1,3-Dichloropropene	Dibenz(a,h)anthracene	Dibenzofuran	Dibromochloromethane	Di-n-octyl phthalate	Ethylbenzene	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Nitrobenzene	N-Nitrosodiphenylamine	Pentachlorophenol	Phenanthrene	Pyrene	Styrene	trans-1,3-Dichloropropene	Vinyl chloride	Xylenes, Total		
		Method																																					
		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
MW-5	05/19/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-5	08/11/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-5	11/17/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	06/19/00	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	04/24/01	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	07/25/01	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	10/24/01	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	01/22/02	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	10/30/02	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	08/12/03	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6A	05/18/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-7 (DUP)	MW-7	06/20/00	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	04/25/01	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	07/26/01	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	10/25/01	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	01/23/02	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	05/07/02	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	08/07/02	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	10/31/02	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	02/05/03	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	05/05/03	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	08/13/03	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	10/29/03	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-7	02/04/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-7	05/20/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-7	08/11/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-7	11/16/04	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-8	09/26/00	<10	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-9	MW-9	06/19/00	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-9	04/24/01	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<25	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	MW-9	07/24/01	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<10	<10	<5.0	<10	<5.0	<10	<10	<10	<10	<10	<														



**TABLE 3-2**

MEW Site File  
3DISC100129



**TABLE 3-2**

MEW Site File  
3DISC100130



MEW Site File  
3DISC100131

113102\_1.xls



**TABLE 3-2**

MEW Site File  
3DISC100132



**TABLE 3-2**

MEW Site File  
3DTS6100133



**TABLE 3-2**

MEW Site File  
3DISC100134



**TABLE 3-2**

MEW Site File  
3DISC100135



**TABLE 3-2**

Notes

- 1-  $\mu\text{g/L}$  = micrograms per liter
- 2-  $< 5.0$  = compound not detected at or above stated reporting limit
- 3- (EPA S) = sample collected by EPA and analyzed by an independent laboratory (original data not available for review)
- 4- (DUP) = duplicate sample
- 5- "-" = not analyzed







**TABLE 3-3**  
**POST REMEDIATION SURFACE WATER ANALYTICAL RESULTS FOR CREEK**  
**MISSOURI ELECTRIC WORKS**

Compound	Analytical Method	Well ID	A	B	C	D1	D2	D3
		Sample Date	08/15/03	08/12/03	08/14/03	08/15/03	08/15/03	08/15/03
Aroclor 1016	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1221	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1232	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1242	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1248	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1254	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aroclor 1260	SW8082	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,1-Trichloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethene, Total	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Butanone	SW8260B	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	SW8260B	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-pentanone	SW8260B	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromodichloromethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromoform	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Carbon disulfide	SW8260B	µg/L	5.3	5.5	18	3.9 J	2.6 J	< 5.0
Carbon tetrachloride	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloromethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	3.1 J
cis-1,3-Dichloropropene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromochloromethane	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methylene chloride	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Styrene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,3-Dichloropropene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl chloride	SW8260B	µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trichlorobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
1,2-Dichlorobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
1,3-Dichlorobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
1,4-Dichlorobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2,4,5-Trichlorophenol	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
2,4,6-Trichlorophenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2,4-Dichlorophenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2,4-Dimethylphenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2,4-Dinitrophenol	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
2,4-Dinitrotoluene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2,6-Dinitrotoluene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Chloronaphthalene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorophenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Methylnaphthalene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Methylphenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
2-Nitroaniline	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
2-Nitrophenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10

MEW Site File  
3DISC100138



**TABLE 3-3**  
**POST REMEDIATION SURFACE WATER ANALYTICAL RESULTS FOR CREEK**  
**MISSOURI ELECTRIC WORKS**

Compound	Analytical Method	Well ID	A	B	C	D1	D2	D3
		Sample Date	08/15/03	08/12/03	08/14/03	08/15/03	08/15/03	08/15/03
3,3'-Dichlorobenzidine	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
3-Nitroaniline	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
4,6-Dinitro-2-methylphenol	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
4-Bromophenyl phenyl ether	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Chloro-3-methylphenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Chloroaniline	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorophenyl phenyl ether	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Methylphenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
4-Nitroaniline	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
4-Nitrophenol	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
Acenaphthene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Acenaphthylene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Anthracene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Benz(a)anthracene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Benzo(a)pyrene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Benzo(b)fluoranthene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Benzo(g,h,i)perylene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Benzo(k)fluoranthene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Bis(2-chloroethoxy)methane	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Bis(2-chloroethyl)ether	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Bis(2-chloroisopropyl)ether	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Bis(2-ethylhexyl)phthalate	SW8270C	µg/L	< 10	3.2 JH	< 10	< 10	8.8 J	1.8 J
Butyl benzyl phthalate	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Carbazole	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Chrysene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Dibenz(a,h)anthracene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Dibenzofuran	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Diethyl phthalate	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Dimethyl phthalate	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Di-n-butyl phthalate	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Di-n-octyl phthalate	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Fluoranthene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Fluorene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Hexachlorobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Hexachlorobutadiene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Hexachlorocyclopentadiene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Hexachloroethane	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Indeno(1,2,3-cd)pyrene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Isophorone	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Nitrobenzene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
N-Nitrosodi-n-propylamine	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
N-Nitrosodiphenylamine	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Pentachlorophenol	SW8270C	µg/L	< 25	< 25	< 25	< 25	< 25	< 25
Phenanthrene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Phenol	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10
Pyrene	SW8270C	µg/L	< 10	< 10	< 10	< 10	< 10	< 10

## Notes

- 1- µg/L = micrograms per liter
- 2- < 0.50 = compound not detected above the reporting limit
- 3- S = spike recovery outside accepted recovery limits
- 4- H = holding times for preparation or analysis exceeded
- 5- J = compound detected above quantitation limit

MEW Site File  
3DISC100139



TABLE 3-4  
SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DETECTED ORGANIC COMPOUNDS  
MISSOURI ELECTRIC WORKS

CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits (ug/L)	Method Detection Limits (ug/L)	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value (ug/L)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
71-55-6	1,1,1-Trichloroethane	1.8J	8	ug/l	MW-10	20/249	5 - 5	0.24 - 0.53	8	NA	320 N	200	MCL/GTARC	N	BSL
75-34-3	1,1-Dichloroethane	1U	31	ug/l	MW-10	72/249	5 - 5	0.12 - 0.40	<u>31</u>	NA	2 C	—	—	Y	ASL
75-35-4	1,1-Dichloroethene	1U	10	ug/l	MW-10	42/249	5 - 5	0.22 - 0.72	10	NA	34 N	7	MCL/GTARC	N	BSL
120-82-1	1,2,4-Trichlorobenzene	1.8J	62	ug/l	MW-7	7/250	10 - 10	0.79 - 1.7	<u>62</u>	NA	0.72 N	70	MCL/GTARC	Y	ASL
95-50-1	1,2-Dichlorobenzene	1.5J	33	ug/l	MW-12	39/250	10 - 10	0.41 - 0.41	33	NA	37 N	600	MCL/GTARC	N	BSL
156-60-5/156-59-2	1,2-Dichloroethene Total	1U	12	ug/l	MW-16C/11	37/249	5 - 5	0.55 - 0.58	<u>12</u>	NA	6.1* N	70*	MCL/GTARC	Y	ASL
541-73-1	1,3-Dichlorobenzene	1J	100	ug/l	MW-12	49/250	10 - 10	0.46 - 1.3	<u>100</u>	NA	18 N	—	—	Y	ASL
106-46-7	1,4-Dichlorobenzene	1J	120	ug/l	MW-12	63/250	10 - 10	0.51 - 1.4	<u>120</u>	NA	0.5 C	75	MCL/GTARC	Y	ASL
95-57-8	2-Chlorophenol	2.1J	9 J	ug/l	MW-12	7/248	10 - 10	1.66 - 1.7	<u>9</u>	NA	3 N	40	GTARC	Y	ASL
67-64-1	Acetone	5U	210	ug/l	MW-4	3/248	10 - 10	1.1 - 7.01	210	NA	550 N	—	—	N	ASL
71-43-2	Benzene	1U	83	ug/l	MW-12	28/249	5 - 5	0.19 - 0.5	<u>83</u>	NA	0.35 C	5	MCL/GTARC	Y	ASL
111-44-4	Bis(2-Chloroethyl) Ether	6J	6J	ug/l	MW-10/4	2/248	10 - 10	1.4 - 1.68	<u>6</u>	NA	0.01C	0.03	GTARC	Y	ASL
117-81-7	Bis(2-ethylhexyl)phthalate	1.6J	120	ug/l	WSW-1/11A	87/248	10 - 10	1.46 - 1.46	<u>120</u>	NA	4.8 C	6	GTARC	Y	ASL
75-27-4	Bromodichloromethane	1.9J	1.9J	ug/l	SP-1	1/249	5 - 5	0.1 - 0.38	<u>1.9</u>	NA	0.18 C	80	MCL/GTARC	Y	ASL
85-68-7	Butyl benzyl phthalate	3.6J	6J	ug/l	MW-12/11	8/248	10 - 10	0.98 - 1.36	6	NA	730 N	3000	GTARC	N	BSL
108-90-7	Chlorobenzene	1U	3200	ug/l	MW-12	88/249	5 - 250	0.16 - 0.57	<u>3200</u>	NA	11 N	100	MCL/GTARC	Y	ASL
67-66-3	Chloroform	1.3J	13	ug/l	SP-1	9/249	5 - 10	0.14 - 0.64	<u>13</u>	NA	0.17 C	80	MCL/GTARC	Y	ASL
74-87-3	Chloromethane	1J	6.3	ug/l	MW-11A	15/249	5 - 5	0.38 - 0.43	6.3	NA	16 N	—	—	N	BSL
84-74-2	Di-n-butylphthalate	1J	14	ug/l	MW-4	11/248	10 - 10	1.26 - 1.58	14	NA	360 N	—	—	N	BSL
131-11-3	Dimethyl phthalate	10U	890	ug/l	MW-12	1/247	10 - 100	1.47 - 3.37	890	NA	36,000 N	313,000	GTARC	N	BSL
84-66-2	Diethyl phthalate	6.6J	6.6J	ug/l	MW-17B	1/247	10 - 10	1.65 - 3.02	6.6	NA	2900 N	23,000	GTARC	N	BSL
75-09-2	Methylene chloride	2J	3J	ug/l	MW-10/WSW-1	9/249	5 - 1000	0.53 - 3.1	3	NA	4.3 C	5	GTARC	N	BSL
91-20-3	Naphthalene	4.7J	8.7J	ug/l	MW-3	3/248	10 - 10	1.5 - 1.89	<u>8.7</u>	NA	0.62 N	100	GTARC	Y	ASL
621-64-7	N-Nitrosodi-n-propylamine	4.5J	8.1J	ug/l	MW-12/17B	3/248	10 - 10	1.81 - 2.52	<u>8.1</u>	NA	0.0096 C	—	—	Y	ASL
11096-82-5	PCB(Aroclor 1260) - filtered	0.2U	4.5	ug/l	MW-11	3/54	0.2 - 10	0.085 - 0.50	<u>4.5</u>	NA	0.034 C	0.5	MCL/GTARC	Y	ASL
	- unfiltered	0.2U	110		MW-11/5	47/253	0.2 - 10	0.085 - 0.50	<u>110</u>	NA					
108-95-2	Phenol	0.2U	260	ug/l	MW-11A	2/248	10 - 10	6.36 - 9.28	260	NA	1100 N	4000	GTARC	N	BSL
127-18-4	Tetrachloroethene	1U	8.6	ug/l	MW-4	11/249	5 - 5	0.43 - 0.44	<u>8.6</u>	NA	0.1 C	5	MCL/GTARC	Y	ASL
108-88-3	Toluene	2J	2 J	ug/l	MW-6A	1/249	5 - 5	0.17 - 0.45	2	NA	72 N	150*	GTARC	N	BSL
79-01-06	Trichloroethene	1U	13	ug/l	MW-10	57/249	5 - 5	0.21 - 0.56	<u>13</u>	NA	0.028 C	5	MCL/GTARC	Y	ASL

Notes

1- J = analyte detected but below limit of quantitation, B = analyte detected in method blank, U = analyte not detected

2-Maximum concentration detected used for screening

3- Background concentrations have not been used for screening

4- U.S. EPA Region 9 preliminary remediation goals for tap water exposure pathways used as the screening toxicity values. Note that the PRG values for non carcinogens have been multiplied by 0.1 to account for potential additivity of non-cancer health effects

5- Rational codes: BSL = below screening level, ASL = above screening level

**Bold underlined values exceed screening toxicity value**

Definitions

N/A = not applicable

\* = lowest MCL used

C = carcinogen

NC = non carcinogen



TABLE 4-1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
MISSOURI ELECTRIC WORKS

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal <sup>1</sup>	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
1,1,2,2-Tetrachloroethane	Chronic	6 0E-02	mg/kg/day	1E+00	6 0E-02	mg/kg/day	Liver	300	RAIS/PPRTV	1/11/2004
1,1,2-Trichloroethane	Chronic	4 0E-03	mg/kg/day	1E+00	4 0E-03	mg/kg/day	Liver, Systemic Tissue	1000	IRIS	1/2/1995
1,1-Dichloroethane	Chronic	1 0E-01	mg/kg/day	1E+00	1 0E-01	mg/kg/day	None Observed	1000	RAIS/HEAST	1/11/2004
1,2 Dichloroethene (trans)	Chronic	2 0E-02	mg/kg/day	1E+00	2 0E-02	mg/kg/day	Blood	1000	IRIS	1/1/1989
1,2 Dichloroethene (cis)	Chronic	1 0E-02	mg/kg/day	1E+00	1 0E-02	mg/kg/day	Blood	3000	U S EPA, 2004/PPRTV, 2002	1/10/2002
1,2,4 Trichlorobenzene	Chronic	1 0E-02	mg/kg/day	1E+00	1 0E-02	mg/kg/day	Adrenal Gland	1000	IRIS	1/11/1996
1,2-Dichloroethane	Chronic	2 0E-02	mg/kg/day	1E+00	2 0E-02	mg/kg/day	Nervous System, Liver, Kidney	1000****	U S EPA, 2004 (H)	1/10/2004
1,2-Dichloropropane **	Chronic	1 1E-03	mg/kg/day	1E+00	1 1E-03	mg/kg/day	Respiratory	300	U S EPA, 2004 (R)	1/10/2004
1,3-Dichlorobenzene	Chronic	3 0E-02	mg/kg/day	1E+00	3 0E-02	mg/kg/day	Liver	No Data	U S EPA, 2004 (NCEA)	1/10/2002
1,4-Dichlorobenzene	Chronic	3 0E-02	mg/kg/day	1E+00	3 0E-02	mg/kg/day	Blood, Liver and Kidney	No Data	U S EPA, 2004 (NCEA)	1/10/2002
2,4,6-Trichlorophenol	Chronic	1.0E-04	mg/kg/day	1E+00	1.0E-04	mg/kg/day	No Data	No Data	U S EPA, 2004 (NCEA)	1/10/2004
2,4-Dinitrotoluene	Chronic	2 0E-03	mg/kg/day	1E+00	2 0E-03	mg/kg/day	Blood, Liver, Reproductive System, Nervous System, Mortality	100	IRIS/RAIS	1/1/2005
2,6-Dinitrotoluene	Chronic	1 0E-03	mg/kg/day	1E+00	1.0E-03	mg/kg/day	Central Nervous System, Blood, Bile Duct, and Kidney	3000	IRIS/ATSDR/HEAST	1/1/1990, 12/1/1998, 1/1/1997
2-Chlorophenol	Chronic	5 0E-03	mg/kg/day	1E+00	5 0E-03	mg/kg/day	Reproductive System	1000	IRIS	1/7/1993
3,3-Dichlorobenzidine	Chronic	No Data	-	1E+00	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
4,6-Dinitro-2-Methyl Phenol	Chronic	1 0E-04	mg/kg/day	1E+00	1 0E-04	mg/kg/day	Eye	No Data	IRIS/PPRTV	1/11/2004
Aroclor-1016	Chronic	7.0E-05	mg/kg/day	1E+00	7 0E-05	mg/kg/day	Fetus (low birth weight)	300	IRIS	10/1/1996
Aroclor-1221	Chronic	No Data	-	1E+00	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
Aroclor-1232	Chronic	No Data	-	1E+00	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
Aroclor-1242	Chronic	No Data	-	1E+00	No Data	-	Liver	No Data	IRIS/RAIS	1/11/2004
Aroclor-1248	Chronic	No Data	-	1E+00	No Data	-	Liver, Thymus, Skin, Developing Fetus	No Data	IRIS	1/11/1996
Aroclor-1254	Chronic	2 0E-05	mg/kg/day	1E+00	2 0E-05	mg/kg/day	Skin, Immune System, Liver	300	IRIS	1/11/1996
Aroclor-1260	Chronic	No Data	-	1E+00	No Data	-	Liver, Skin, Immune System	No Data	IRIS/RAIS	1/11/2004
Benzene	Chronic	4 0E-03	mg/kg/day	1E+00	4 0E-03	mg/kg/day	Blood, Immune System	300	IRIS	4/17/2003
Benz(a)anthracene	Chronic	No Data	mg/kg/day	3 1E-01 <sup>2</sup>	No Data	-	Hematopoietic System, Fetus, Reproductive System, Lymphoid System, Intestinal Epithelium	No Data	IRIS/RAIS	1/1/2005
Benzo(a)pyrene	Chronic	No Data	-	3 1E-01 <sup>2</sup>	No Data	-	No Data	No Data	IRIS/RAIS	1/1/2005
Benzo(b)fluoranthene	Chronic	No Data	-	3 1E-01 <sup>2</sup>	No Data	-	No Data*	No Data	IRIS/RAIS	1/1/2005
Benzo(k)fluoranthene	Chronic	No Data	-	3 1E-01 <sup>2</sup>	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
bis(2-Chloroethyl) Ether	Chronic	No Data	-	1E+00	No Data	-	No Data	No data	RAIS/IRIS	1/11/2004
bis(2-Chloroisopropyl) Ether	Chronic	4 0E-02	mg/kg/day	1E+00	4 0E-02	mg/kg/day	Blood	1000	IRIS	1/8/1990
bis (2-Ethylhexyl phthalate)	Chronic	2 0E-02	mg/kg/day	1 9E-01 <sup>3</sup>	3 8E-03	mg/kg/day	Liver, Kidney	1000	IRIS	1/10/2002
Bromodichloromethane	Chronic	2 0E-02	mg/kg/day	1E+00	2 0E-02	mg/kg/day	Kidney	1000	IRIS	1/3/1991
Carbon Tetrachloride	Chronic	7 0E-04	mg/kg/day	1E+00	7 0E-04	mg/kg/day	Liver	1000	IRIS	1/6/1991
Chlorobenzene	Chronic	2 0E-02	mg/kg/day	3 1E-01 <sup>4</sup>	6 2E-03	mg/kg/day	Liver	1000	IRIS	1/7/1993
Chlorodibromomethane	Chronic	2 0E-02	mg/kg/day	1E+00	2 0E-02	mg/kg/day	Liver	1000	IRIS	1/3/1991
Chloroform	Chronic	1 0E-02	mg/kg/day	2 0E-01 <sup>5</sup>	2 0E-03	mg/kg/day	Liver	1000	IRIS	10/19/2001
Dibenz(a,h)Anthracene	Chronic	No Data	-	3 1E-01 <sup>6</sup>	No Data	-	No Data	No Data	RAIS/IRIS	1/11/2004
Dibenzofuran	Chronic	4 0E-03	mg/kg/day	1E+00	4 0E-03	mg/kg/day	Kidney	10000	RAIS/PPRTV	1/11/2004
Hexachloro-1,3-Butadiene	Chronic	2 0E-04	mg/kg/day	1E+00	2 0E-04	mg/kg/day	Kidney	1000	RAIS/HEAST	1/11/2004
Hexachlorobenzene	Chronic	8 0E-04	mg/kg/day	1E+00	8 0E-04	mg/kg/day	Liver	100	IRIS	1/4/1991
Indeno(1,2,3-cd)Pyrene	Chronic	No Data	-	3 1E-01 <sup>2</sup>	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
2-methylnaphthalene	Chronic	4 00E-03	mg/kg/day	1E+00	4 0E-03	mg/kg/day	Lung	1000	IRIS/RAIS	1/1/2005
Naphthalene	Chronic	2 0E-02	mg/kg/day	1E+00	2.0E-02	mg/kg/day	Blood, Liver, Kidney, Nervous System, Reproductive System	3000	IRIS	09/17/1998
Nitrobenzene	Chronic	5 0E-04	mg/kg/day	1E+00	5 0E-04	mg/kg/day	Liver, Kidney	10000	IRIS	1/1/1991
N-Nitrosodl-n-propylamine	Chronic	No Data	-	2 5E-01 <sup>7</sup>	No Data	-	No Data	No Data	IRIS/RAIS	1/11/2004
Pentachlorophenol	Chronic	3 0E-02	mg/kg/day	1E+00	3 0E-02	mg/kg/day	Liver, Kidney	100	IRIS/RAIS	1/1/2005
Tetrachloroethene	Chronic	1 0E-02	mg/kg/day	1E+00	1 0E-02	mg/kg/day	Liver	1000	IRIS	1/3/1998
Trichloroethene	Chronic	3 0E-04	mg/kg/day	1 5E-01 <sup>8</sup>	4 5E-05	mg/kg/day	Liver, Kidney and Developing fetus	3000	U S EPA, 2001	1/8/2001
Vinyl Chloride	Chronic	3 0E-03	mg/kg/day	1E+00	3 0E-03	mg/kg/day	Liver	30	IRIS	7/8/2000

Notes:

1 Oral absorption efficiencies have been taken from U.S.EPA RAGS E guidance unless otherwise noted. For those chemicals with an absorption efficiency greater than or equal to 0.5, 1.0 has been used as the absorption efficiency

2 Rahman, A. J. A. Barrowman and A. Rahimifula. 1986 The influence of bile on the bioavailability of polynuclear aromatic hydrocarbons from the rat intestine. Can. J. Physiol. Pharmacol. 64 1214-1218.

3 Tettyrnick, O.A. and J. Belpaire. 1985 Disposition of orally administered di(2-ethylhexyl)phthalate and mono(2-ethylhexyl)phthalate in the rat. Arch. Toxicol. 57(4) 226-230

4 ATSDR (Agency for Toxic Substances and Disease Registry). 1990 Toxicological Profile for Chlorobenzene. ATSDR/U.S. Public Health Service

5 Brown, D.M., P.F. Longely, D. Smith, et al. 1974 Metabolism of Chloroform. I. The metabolism of [14C]-chloroform by different species. Xenobiotica 4 151-163.

6 United States Environmental Protection Agency. 1995 Supplemental Guidance to RAGS. Region 4 Bulletin. Human Health Risk Assessment (Interim Guidance) Waste Management Division, Office of Health Assessment. <http://www.epa.gov/region4/waste/ohts/ohsguid.htm>

7 ATSDR (Agency for Toxic Substances and Disease Registry). 1989 Toxicological Profile for N-Nitrosodl-n-propylamine. ATSDR/U.S. Public Health Service.

8 Daniel, J.W. 1963 The metabolism of 36C-labelled trichloroethylene and tetrachloroethylene in the rat. Biochem. Pharmacol. 12 795-802.

U.S.EPA, 2001 - Values listed are from trichloroethylene health risk assessment, synthesis and characterization, EPA/600/P-01/002A, August 2001, Draft Report for External Review

IRIS - Values listed were taken from the EPA's Integrated Risk Information System

U.S.EPA, 2004 - Values listed are from EPA Region 9 PRGs Table, 10/01/04 (R= route extrapolation, NCEA = National Center for Environmental Assessment, H = HEAST)

RAIS - Values listed were taken from the Risk Assessment Information System (December, 2004)

HEAST - Values listed were taken from the EPA's Health Effects Summary Tables (as provided in RAIS database)

PPRTV - Values listed are provisional. In nearly every instance these values are Provisional Peer-Reviewed Toxicity Values (as provided in RAIS database or EPA documents)

\* No data were available to determine target organs/critical effects for oral, inhalation, or other routes of exposure to benzo(b)fluoranthene (RAIS, 2005)

\*\* Route extrapolation used to determine RfD as shown on EPA Region 9 PRG table

- Not Applicable



TABLE 4-2  
NON-CANCER TOXICITY DATA -- INHALATION  
MISSOURI ELECTRIC WORKS

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD <sub>inh</sub>		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value <sup>1</sup>	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
1,1,2,2-Tetrachloroethane	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
1,1,2-Trichloroethane	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
1,1-Dichloroethane	Chronic	5 00E-01	mg/m3	1 43E-01	mg/kg-d	Kidney	1000	RAIS/HEAST*	11/01/04
1,2 dichloroethene (cis)	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
1,2-dichloroethene (trans)	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
1,2,4-trichlorobenzene	Chronic	4 00E-03	mg/m3	1 14E-03	mg/kg-d	Liver	1000	PPRTV, 2002	10/01/92
1,2 Dichloroethane	Chronic	4 90E-03	mg/m3	1 40E-03	mg/kg-d	No Data	No Data	U S EPA, 2004 (NCEA)	10/01/04
1,2-Dichloropropane	Chronic	4 00E-03	mg/m3	1.14E-03	mg/kg-d	Nasal	300	IRIS	12/01/91
1,3-Dichlorobenzene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
1,4-Dichlorobenzene	Chronic	8 00E-01	mg/m3	2 30E-01	mg/kg-d	Liver	100	IRIS	11/01/96
2,4,6-Trichlorophenol	Chronic	Not Derived	-	Not Derived	-	Not Known	Not Known	IRIS	04/24/91
2,4-Dinitrotoluene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
2,6-Dinitrotoluene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
2-Chlorophenol	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
3,3-Dichlorobenzidine	Chronic	Not Derived	-	Not Derived	-	Not Known	Not Known	IRIS	09/12/91
4,6-Dinitro-2-Methyl Phenol	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	11/01/04
Aroclor-1016	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1221	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1232	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1242	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1248	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1254	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Aroclor-1260	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Benzene	Chronic	3 00E-02	mg/m3	8 57E-03	mg/kg-d	Bone Marrow	300	IRIS	04/17/03
Benz(a)anthracene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	01/01/05
Benzo(a)pyrene	Chronic	No Data	-	No Data	-	No Data	Not Known	IRIS/RAIS	-
Benzo(b)fluoranthene	Chronic	No Data	-	No Data	-	No Data***	No Data	IRIS/RAIS	01/01/05
Benzo(k)fluoranthene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
bis(2-Chloroethyl) Ether	Chronic	Not Derived	-	No Data	-	No Data	No Data	IRIS/RAIS	10/01/91
bis(2-Chloroisopropyl) Ether	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
bis (2-ethylhexyl) phthalate	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Bromodichloromethane	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Carbon Tetrachloride	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Chlorobenzene	Chronic	6 00E-02	mg/m3	1 70E-02	mg/kg-d	Liver	Not Known	U S EPA, 2002	10/01/02
Chlorodibromomethane	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Chloroform	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Dibenz(a,h)Anthracene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Dibenzofuran	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Hexachloro-1,3-Butadiene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Hexachlorobenzene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Indeno(1,2,3-cd)Pyrene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
2-methylnaphthalene	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Naphthalene	Chronic	3 00E-03	mg/m3	8 57E-04	mg/kg-d	Blood, GIT, Eye, Liver, Kidney, Nervous System	3000	IRIS/RAIS	09/17/98
Nitrobenzene	Chronic	2 00E-03	mg/m3	5 71E-04	mg/kg-d	Blood, Adrenal, Kidney and Liver	1E+04	RAIS/HEAST*	11/01/04
N-Nitrosodi-n-propylamine	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Pentachlorophenol	Chronic	No Data	-	No Data	-	No Data	No Data	IRIS/RAIS	-
Tetrachloroethene	Chronic	5 00E-01	mg/m3	1 40E-01	mg/kg-d	Liver	30 B 300	NCEA, 2002	05/24/02
Trichloroethene	Chronic	4 00E-02	mg/m3	1 14E-02	mg/kg-d	Central Nervous System, Liver and Endocrine system	1000	U S EPA, 2001	08/01/01
Vinyl Chloride	Chronic	1 00E-01	mg/m3	2.86E-02	mg/kg-d	Liver	30	IRIS/RAIS	08/07/00

Notes:  
1 If RfC not available, calculated assuming 70 kg adult breathes 20 m3 air/day  
U S EPA, 2001 Trichloroethylene health risk assessment synthesis and characterization. EPA/600/P-01/002A, August 2001. Draft Report for External Review  
U S EPA, 2004 - Values listed are from EPA Region 9 PRGs Table, 10/01/04 (NCEA = National Center for Environmental Assessment, H = HEAST)  
USEPA, 2004b - Provisional RfC taken from EPA Air Toxics Web Site (November, 2004) www.epa.gov/ttn/atw  
IRIS - Values listed were taken from the EPA's Integrated Risk Information System  
RAIS - Values listed were taken from the Risk Assessment Information System (December, 2004)  
HEAST - Values listed were taken from the EPA's Health Effects Summary Tables (as provided in RAIS database)  
PPRTV - Values listed are provisional. In nearly every instance these values are Provisional Peer-Reviewed Toxicity Values (as provided in RAIS database)  
NCEA, 2002 Health Assessment Document for Tetrachloroethylene Final Report U S Environmental Protection Agency, D C . EPA/600/8-82/005F  
\* Considered to be an adequate provisional value identified in EPA documents, but is subject to review (RAIS, 2004)  
\*\*\*The available data do not permit determination of primary target organs (RAIS, 2005)  
\*\*\* No data were available to determine target organs/critical effects for oral, inhalation, or other routes of exposure to benzo(b)fluoranthene



TABLE 4-3  
CANCER TOXICITY DATA -- ORAL/DERMAL  
MISSOURI ELECTRIC WORKS

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
1,1,2,2-Tetrachloroethane	2 0E-01	1/mg/kg/day	1E+00	2 0E-01	1/mg/kg/day	C	IRIS	12/3/2002
1,1,2-Trichloroethane	5 7E-02	1/mg/kg/day	1E+00	5 7E-02	1/mg/kg/day	C	IRIS	2/1/1994
1,1-Dichloroethane	No Data	-	1E+00	No Data	-	C	IRIS	12/01/96
cis 1,2-dichloroethene	NA	-	1E+00	NA	-	D	IRIS	02/01/95
trans 1,2-dichloroethene	NA	-	1E+00	NA	-	D	IRIS/RAIS	1/1/2005
1,2,4-trichlorobenzene	NA	-	1E+00	NA	-	D	IRIS	03/01/91
1,2-Dichloroethane	9 1E-02	1/mg/kg/day	1E+00	9 1E-02	1/mg/kg/day	B2	IRIS	1/1/1991
1,2-Dichloropropane	6 8E-02	1/mg/kg/day	1E+00	6 8E-02	1/mg/kg/day	B2	HEAST/RAIS	11/1/2004
1,3-Dichlorobenzene	NA	-	1E+00	NA	-	D	IRIS	09/01/90
1,4-Dichlorobenzene	2 4E-02	1/mg/kg/day	1E+00	2 4E-02	1/mg/kg/day	C	RAIS/HEAST	11/1/2004
2,4,6-Trichlorophenol	1 1E-02	1/mg/kg/day	1E+00	1 1E-02	1/mg/kg/day	B2	IRIS	2/1/1994
2,4-Dinitrotoluene	6 8E-01	1/mg/kg/day	1E+00	8 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/1/2005
2,6-Dinitrotoluene	6 7E+00	1/mg/kg/day	1E+00	6 7E+00	1/mg/kg/day	B2	IRIS/RAIS	9/1/1990
2-Chlorophenol	No Data	-	1E+00	No Data	-	Not Known	IRIS	07/01/93
3,3-Dichlorobenzidine	4 5E-01	1/mg/kg/day	1E+00	4 5E-01	1/mg/kg/day	B2	IRIS	7/1/1993
4,6-Dinitro-2-Methyl Phenol	No Data	-	1E+00	No Data	-	Not Known	RAIS/IRIS	11/1/2004
Aroclor-1016	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	Not Known	IRIS/RAIS	10/01/96, 01/01/05
Aroclor-1221	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Aroclor-1232	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Aroclor-1242	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Aroclor-1248	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Aroclor-1254	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Aroclor-1260	4 0E-01	1/mg/kg/day	1E+00	4 0E-01	1/mg/kg/day	B2	IRIS/RAIS	1/6/1997, 01/01/05
Benzene	5 5E-02	1/mg/kg/day	1E+00	5 5E-02	1/mg/kg/day	A	IRIS/RAIS	01/19/00
Benz(a)anthracene	7 3E-01	1/mg/kg/day	3 1E-01 <sup>2</sup>	2 3E-01	1/mg/kg/day	B2	IRIS/RAIS	1/1/2005
Benzo(a)pyrene	7 3E+00	1/mg/kg/day	3 1E-01 <sup>2</sup>	2 3E+00	1/mg/kg/day	B2	IRIS/RAIS	1/1/2005
Benzo(b)fluoranthene	7 3E-01	1/mg/kg/day	3 1E-01 <sup>2</sup>	2 3E-01	1/mg/kg/day	B2	IRIS/RAIS	1/1/2005
Benzo(k)fluoranthene **	7 3E-02	1/mg/kg/day	3 1E-01 <sup>2</sup>	2 3E-02	1/mg/kg/day	B2	IRIS/RAIS	3/1/1994
bis (2-ethylhexyl) phthalate	1 4E-02	1/mg/kg/day	1E+00	1 4E-02	1/mg/kg/day	B2	IRIS	02/01/93
bis(2-Chloroethyl) Ether	1 1E+00	1/mg/kg/day	1E+00	1 1E+00	1/mg/kg/day	B2	IRIS	1/2/1994
bis(2-Chloroisopropyl) Ether	No Data	-	1 9E-01 <sup>3</sup>	No Data	-	Not Known	IRIS	11/1/2004
Bromodichloromethane	6 2E-02	1/mg/kg/day	1E+00	6 2E-02	1/mg/kg/day	B2	IRIS	1/3/1993
Carbon Tetrachloride	1 3E-01	1/mg/kg/day	1E+00	1 3E-01	1/mg/kg/day	B2	IRIS	6/1/1991
Chlorobenzene	NA	-	3 1E-01 <sup>4</sup>	NA	-	D	IRIS	03/01/91
Chlorodibromomethane	8 4E-02	1/mg/kg/day	1E+00	8 4E-02	1/mg/kg/day	C	IRIS	1/1/1992
Chloroform	No Data	-	2 0E-01 <sup>5</sup>	No Data	-	B2	IRIS	10/19/2001
Dibenz(a,h)Anthracene **	7 3E+00	1/mg/kg/day	3 1E-01 <sup>6</sup>	7 3E+00	1/mg/kg/day	B2	IRIS	3/1/1994
Dibenzofuran	NA	-	1E+00	NA	-	D	IRIS	10/1/1990
Hexachloro-1,3-Butadiene	7 8E-02	1/mg/kg/day	1E+00	7 8E-02	1/mg/kg/day	C	IRIS	4/1/1991
Hexachlorobenzene	1 6E+00	1/mg/kg/day	1E+00	1 6E+00	1/mg/kg/day	B2	IRIS	11/1/1995
Indeno(1,2,3-cd)Pyrene **	7 3E-01	1/mg/kg/day	3 1E-01 <sup>2</sup>	2 3E-01	1/mg/kg/day	B2	IRIS/RAIS	3/1/1994
2-Methylnaphthalene	No Data	-	1E+00	No Data	-	Not Known	IRIS/RAIS	12/22/2003
Naphthalene	Not Derived	-	1E+00	Not Derived	-	C	IRIS	09/17/98
Nitrobenzene	NA	-	1E+00	NA	-	D	IRIS	2/1/1994
N-Nitrosodi-n-propylamine	7 0E+00	1/mg/kg/day	2 5E-01 <sup>7</sup>	1 8E+00	1/mg/kg/day	B2	IRIS	07/01/93
Pentachlorophenol	1 2E-01	1/mg/kg/day	1E+00	1 2E-01	1/mg/kg/day	B2	IRIS/RAIS	1/1/2005
Tetrachloroethene	5 4E-01	1/mg/kg/day	1E+00	5 4E-01	1/mg/kg/day	C - B2 continuum	U S EPA, 2004	10/01/04
Trichloroethene <sup>9</sup>	4 0E-01	1/mg/kg/day	1 5E-01 <sup>8</sup>	6 0E-02	1/mg/kg/day	Highly Likely	U S EPA, 2001	08/01/01
Trichloroethene	2 0E-02	1/mg/kg/day	1 5E-01	3 0E-03	1/mg/kg/day	Highly Likely	U S EPA, 2001	08/01/01
Trichloroethene	6 0E-03	1/mg/kg/day	1 5E-01	9 0E-04	1/mg/kg/day	C - B2 continuum	U S EPA, 1987	01/01/87
Vinyl Chloride	7 2E-01	1/mg/kg/day	1E+00	7 2E-01	1/mg/kg/day	A	IRIS	8/7/2000

Notes

1. Oral absorption efficiencies have been taken from U.S. EPA RAGS E guidance, unless otherwise noted. For those chemicals with an absorption efficiency greater than or equal to 0.5, 1.0 has been used as the absorption efficiency.
2. Rahman, A., J. A. Barrowman and A. Rahimtula. 1986. The influence of bile on the bioavailability of polynuclear aromatic hydrocarbons from the rat intestine. Can. J. Physiol. Pharmacol. 64:1214-1218.
3. Terlynick, O.A. and J. Belpaire. 1985. Disposition of orally administered di(2-ethylhexyl)phthalate and mono(2-ethylhexyl)phthalate in the rat. Arch. Toxicol. 57(4):226-230.
4. ATSDR (Agency for Toxic Substances and Disease Registry). 1990. Toxicological Profile for Chlorobenzene. ATSDR/U.S. Public Health Service.
5. Brown, D.M., P.F. Langely, D. Smith, et al. 1974. Metabolism of Chloroform. I. The metabolism of [14C]-chloroform by different species. Xenobiotica 4:151-163.
6. United States Environmental Protection Agency. 1995. Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment (Interim Guidance). Waste Management Division, Office of Health Assessment. <http://www.epa.gov/region4/waste/ots/otsguid.htm>.
7. ATSDR (Agency for Toxic Substances and Disease Registry). 1989. Toxicological Profile for N-Nitrosodi-n-propylamine. ATSDR/U.S. Public Health Service.
8. Daniel, J.W. 1963. The metabolism of 36Cl-labeled trichloroethylene and tetrachloroethylene in the rat. Biochem. Pharmacol. 12:795-802.
9. Three slope factors have been quoted for TCE, the U.S. EPA, 1987 value and the range of values quoted in U.S. EPA, 2001.
- NA - Not Applicable
- A - Human Carcinogen
- B2 - Probable Human Carcinogen
- C - Possible Human Carcinogen
- D - Not Human Carcinogen
- U.S. EPA. 1987. Addendum to the Health Assessment Document for Trichloroethylene. Updated Carcinogenicity Assessment for Trichloroethylene. External Review Draft. Office of Health and Environmental Assessment, Office of Research and Development, Washington, DC. EPA/600/5-82/006FA, PB87-228045.
- U.S. EPA, 2001. Trichloroethylene health risk assessment, synthesis and characterization, EPA/600/P-01/002A, August 2001, Draft Report for External Review.
- U.S. EPA, 2002. EPA Region 9 PRGs Table, 10/01/02.
- U.S. EPA, 2003. OSWER Directive 9285.7-75, June 12, 2003.
- U.S. EPA, 2004. EPA Region 9 PRG Table, 10/01/04.
- IRIS - Values listed were taken from the EPA's Integrated Risk Information System.
- RAIS - Values listed were taken from the Risk Assessment Information System (December, 2004).
- HEAST - Values listed were taken from the EPA's Health Effects Summary Tables (as provided in RAIS database).
- PPRTV - Values listed are provisional. In nearly every instance these values are Provisional Peer-Reviewed Toxicity Values (as provided in RAIS database).
- \* The Oral Cancer Slope Factor was derived as described in Supplemental Guidance from RAGS: Region 4 Bulletins, Human Health Risk Guidance (November 1995).
- \*\* Oral Cancer Slope Factor Calculated using Toxicity Equivalency Factor (TEF) methodology for carcinogenic polycyclic aromatic hydrocarbons (PAHs) as described in Supplemental Assessment (Interim Guidance from RAGS Region 4 Bulletins, Human Health Risk Assessment) (Interim Guidance) (November 1995).
- Not Applicable



TABLE 4-4  
CANCER TOXICITY DATA -- INHALATION  
MISSOURI ELECTRIC WORKS

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk . Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
1,1,2,2-Tetrachloroethane	5.8E-02	1/mg/m3	2.03E-01 **	1/mg/kg/day	C	IRIS	02/01/1994
1,1,2-Trichloroethane	1.6E-02	1/mg/m3	5.70E-02	1/mg/kg/day	C	IRIS	02/01/1994
1,1-Dichloroethane	No Data	-	No Data	-	C	IRIS	12/01/1996
1,2-dichloroethene (cis)	NA	-	NA	-	D	IRIS	02/01/1995
1,2-dichloroethene (trans)	No Data	-	No Data	-	D	IRIS	11/01/2004
1,2,4-trichlorobenzene	NA	-	NA	-	D	IRIS	03/01/1991
1,2-Dichloroethane	2.6E-02	1/mg/m3	9.1E-02 **	1/mg/kg/day	B2	IRIS	01/01/1991
1,2-Dichloropropane	No Data	-	No Data	-	B2	IRIS/RAIS	11/01/2004
1,3-Dichlorobenzene	NA	-	NA	-	D	RAIS	09/01/1990
1,4-Dichlorobenzene	6.3E-03	1/mg/m3	2.20E-02	1/mg/kg/day	C	U.S.EPA, 2002	10/01/1992
2,4,6-Trichlorophenol	3.1E-03	1/mg/m3	1.09E-02 **	1/mg/kg/day	B2	IRIS	02/01/1994
2,4-Dinitrotoluene	No Data	-	No Data	-	B2	IRIS/RAIS	01/01/2005
2,6-Dinitrotoluene	No Data	-	No Data	-	B2	IRIS	09/01/1990
2-Chlorophenol	No Data	-	No Data	-	Not Known	IRIS	07/01/1993
3,3-Dichlorobenzidine	No Data	-	No Data	-	B2	IRIS	07/01/1993
4,6-Dinitro-2-Methyl Phenol	No Data	-	No Data	-	Not Known	IRIS/RAIS	11/01/2004
Aroclor-1016	1.0E-01	1/mg/m2	4E-01 **	1/mg/kg/day	Not Known	IRIS	10/01/1996, 01/01/2005
Aroclor-1221	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Aroclor-1232	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Aroclor-1242	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Aroclor-1248	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Aroclor-1254	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Aroclor-1260	1.0E-01	1/mg/m3	4E-01 **	1/mg/kg/day	B2	IRIS	06/01/1997
Benzene	7.8E-03	1/mg/m3	2.73E-02	1/mg/kg/day	A	IRIS	01/19/2000
Benz(a)anthracene	No Data	-	3.08E-01	1/mg/kg/day	B2	IRIS/RAIS	01/01/2005
Benzo(a)pyrene	8.8E-01	1/mg/m3	3.08E+00	1/mg/kg/day	B2	IRIS/RAIS	01/01/2005
Benzo(b)fluoranthene	8.8E-02	1/mg/m3	3.08E-01	1/mg/kg/day	B2	IRIS/RAIS	01/01/2005
Benzo(k)fluoranthene ***	8.8E-02	1/mg/m3	3.08E-01 **	1/mg/kg/day	B2	RAIS	01/11/2004
bis(2-Chloroethyl) Ether	3.3E-01	1/mg/m3	1.16E+00	1/mg/kg/day	B2	IRIS	02/01/1994
bis(2-Chloroisopropyl) Ether	No Data	-	No Data	-	Not Known	IRIS	11/01/2004
bis (2-ethylhexyl) phthalate	No Data	-	No Data	-	B2	IRIS	02/01/1993
Bromodichloromethane	No Data	-	No Data	-	B2	IRIS	03/01/1993
Carbon Tetrachloride	1.5E-02	1/mg/m3	5.2E-02 **	1/mg/kg/day	B2	IRIS/RAIS	06/01/1991
Chlorobenzene	NA	-	NA	-	D	IRIS	03/01/1991 ;
Chlorodibromomethane	No Data	-	No Data	-	C	IRIS	11/01/2004 ;
Chloroform	2.3E-02	1/mg/m3	8.10E-02	1/mg/kg/day	B2	IRIS	10/19/2001
Dibenz(a,h)Anthracene ***	8.8E-02	1/mg/m3	3.08E-01 **	1/mg/kg/day	B2	IRIS/RAIS	03/01/2004
Dibenzofuran	NA	-	NA	-	D	IRIS	10/01/1990
Hexachloro-1,3-Butadiene	2.2E-02	1/mg/m3	7.7E-02 **	1/mg/kg/day	C	IRIS	04/01/1991
Hexachlorobenzene	4.6E-01	1/mg/m3	1.61E+00 **	1/mg/kg/day	B2	IRIS	11/01/1996
Indeno(1,2,3-cd)Pyrene ***	8.8E-02	1/mg/m3	3.08E-01 **	1/mg/kg/day	B2	RAIS	11/01/2004
Methylnaphthalene	No Data	-	No Data	-	Not Known	IRIS/RAIS	12/22/2003
Naphthalene	Not Derived	-	Not Derived	-	C	IRIS	11/01/2004
Nitrobenzene	NA	-	NA	-	D	IRIS	02/01/1995
N-Nitrosodi-n-propylamine	No Data	-	No Data	-	B2	IRIS	11/01/2004
Pentachlorophenol	No Data	-	No Data	-	B2	IRIS/RAIS	01/01/2005
Tetrachloroethene	5.9E-03	1/mg/m3	2.10E-02	1/mg/kg/day	C-B2 Continuum	U.S.EPA, 2003	04/25/2003
Trichloroethene	5.7E-03	1/mg/m3	2.00E-02	1/mg/kg/day	Highly Likely	U.S.EPA, 2001	08/01/2001
Trichloroethene	1.7E-03	1/mg/m3	6.00E-03	1/mg/kg/day	C-B2 Continuum	U.S.EPA, 1987	01/01/1987
Trichloroethene <sup>1</sup>	1.1E-01	1/mg/m3	4.00E-01	1/mg/kg/day	Highly Likely	U.S.EPA, 2001	08/01/2001
Vinyl Chloride	8.8E-03	1/mg/m3	3.0E-02 **	1/mg/kg/day	A	IRIS	08/07/2000

Notes

- NA - Not Applicable
- A -Human Carcinogen
- B2 - Probable Human Carcinogen
- C- Possible Human Carcinogen
- D- Not Human Carcinogen

IRIS - Values listed were taken from the EPA's Integrated Risk Information System

RAIS - Values listed were taken from the Risk Assessment Information System (December, 2004)

HEAST - Values listed were taken from the EPA's Health Effects Summary Tables (as provided in RAIS database)

PPRTV - Values listed are provisional. In nearly every instance these values are Provisional Peer-Reviewed Toxicity Values (as provided in RAIS database)

1 Three slope factors have been quoted for TCE, the U.S.EPA, 1987 value and the range of values quoted in U.S.EPA, 2001 Assessment, Office of Research and Development, Washington, DC. EPA/600/8-82/006FA, PB87-228045

U.S.EPA, 2001 Trichloroethylene health risk assessment, synthesis and characterization, EPA/600/P-01/002A, August 2001

U.S.EPA, 2002 EPA Region 9 PRGs Table, 10/01/02

U.S.EPA, 2003 OSWER Directive 9285.7-74, April 25, 2003

\* This value was withdrawn by NCEA and is now being reassessed for IRIS which automatically flags further use of any provisional cancer or non-cancer assessments " If this chemical is identified as a risk driver, the risk assessor should consult The EPA Superfund Technical Support Center

\*\* The Inhalation Slope Factor was calculated from inhalation unit risk as described in Supplemental Guidance from RAGS Region 4 Bulletins, Human Health Risk Guidance) (November 1995)

\*\*\* Calculated using Toxicity Equivalency Factor (TEF) methodology for carcinogenic polycyclic aromatic hydrocarbons (PAHs) as described in Supplemental Assessment (Interim Guidance from RAGS Region 4 Bulletins, Human Health Risk Assessment (Interim Guidance) (November 1995)

- Not Applicable















**TABLE 6-3**  
**COPC SOURCE CONCENTRATIONS USED FOR JOHNSON-ETTINGER MODEL**  
**MISSOURI ELECTRIC WORKS**

Chemical	Henry's Law Constant		On-Site Groundwater Source Concentration for J&E <sup>(1)</sup> Modelling	Off-Site Groundwater Source Concentration for J&E Modelling
	atm-m <sup>3</sup> /mol	Source	95th UCL <sup>(2)</sup> Concentrations and 0.5 MDLs <sup>(3)</sup> for Non-detectable COPC	Modelled Maximum Concentration in Layer 1 of Wetland
			ug/L	ug/L
1,1,2,2-Tetrachloroethane	3.45E-04	USEPA, 1996 <sup>(4)</sup>	0.235	4.371E-03
1,1,2-Trichloroethane	9.13E-04	USEPA, 1996	0.165	3.861E-02
1,1-Dichloroethane	5.62E-03	USEPA, 1996	18.776	5.766E-01
Total 1,2 Dichloroethene	9.38E-03	USEPA, 1996	8.939	1.5
1,2,4 Trichlorobenzene	1.42E-03	USEPA, 1996	25.345	2
1,2-Dichloroethane	9.79E-04	USEPA, 1996	0.290	6.786E-02
1,2-Dichloropropane	2.80E-03	USEPA, 1996	0.155	3.627E-02
1,3-Dichlorobenzene	2.63E-03	SRC PhysProp Database <sup>(5)</sup>	76.732	3.42
1,4-Dichlorobenzene	2.43E-03	USEPA, 1996	84.196	2.47
2,4,6-Trichlorophenol	7.79E-06	USEPA, 1996	nm	nm
2,4-Dinitrotoluene	9.26E-08	USEPA, 1996 <sup>(4)</sup>	nm	nm
2,6-Dinitrotoluene	3.05E-05	RAIS, 2005	nm	nm
2-Chlorophenol	3.91E-04	USEPA, 1996	5.701	1.674E-01
3,3-Dichlorobenzidine	4.00E-09	USEPA, 1996	nm	nm
4,6-Dinitro-2-Methyl Phenol	1.40E-06	SRC PhysProp Database <sup>(5)</sup>	nm	nm
Aroclor-1016	8.18E-03	RAIS, 2005	0.250	9.850E-05
Aroclor-1221	2.28E-04	SRC PhysProp Database	nm	nm
Aroclor-1232	6.95E-04	SRC PhysProp Database	nm	nm
Aroclor-1242	3.43E-04	SRC PhysProp Database	0.100	3.940E-05
Aroclor-1248	4.40E-04	SRC PhysProp Database	nm	nm
Aroclor-1254	2.83E-04	SRC PhysProp Database	0.110	4.334E-05
Aroclor-1260 (Filtered)	3.36E-04	SRC PhysProp Database	3.939	1.773E-03
Benzene	5.55E-03	USEPA, 1996	58.986	0.562
Benzo(a)anthracene	3.35E-06	USEPA, 1996	nm	nm
Benzo(a)pyrene	1.13E-03	USEPA, 1996	nm	nm
Benzo(b)fluoranthene	1.11E-04	USEPA, 1996	1.215	1.604E-04
Benzo(k)fluoranthene	8.29E-07	USEPA, 1996	nm	nm
Bis (2-ethylhexyl phthalate)	1.02E-07	USEPA, 1996	nm	nm
bis(2-Chloroethyl) Ether	1.80E-05	USEPA, 1996	5.195	1.404E+00
bis(2-Chloroisopropyl) Ether	7.42E-05	SRC PhysProp Database	nm	nm
Bromodichloromethane	1.60E-03	USEPA, 1996	2.500	5.850E-01
Carbon Tetrachloride	3.04E-02	USEPA, 1996	0.210	3.906E-03



**TABLE 6-3**  
**COPC SOURCE CONCENTRATIONS USED FOR JOHNSON-ETTINGER MODEL**  
**MISSOURI ELECTRIC WORKS**

Chemical	Henry's Law Constant		On-Site Groundwater Source Concentration for J&E <sup>(1)</sup> Modelling	Off-Site Groundwater Source Concentration for J&E Modelling
			95th UCL <sup>(2)</sup> Concentrations and 0.5 MDLs <sup>(3)</sup> for Non-detectable COPC	Modelled Maximum Concentration in Layer 1 of Wetland
	atm-m <sup>3</sup> /mol	Source	ug/L	ug/L
Chlorobenzene	3.70E-03	USEPA, 1996	2611.782	507
Chlorodibromomethane	7.83E-04	USEPA, 1996	0.205	4.797E-02
Chloroform	3.67E-03	USEPA, 1996	2.547	3.042E+00
Dibenzo(a,h)Anthracene	1.47E-08	USEPA, 1996	nm	nm
Dibenzofuran	2.13E-04	SRC PhysProp Database	0.825	3.251E-04
Hexachloro-1,3-Butadiene	8.15E-03	USEPA, 1996	0.745	2.935E-04
Hexachlorobenzene	1.32E-03	USEPA, 1996	0.740	7.548E-04
Indeno(1,2,3-cd)Pyrene	1.60E-06	USEPA, 1996	nm	nm
2-methylnaphthalene	2.12E-02	RAIS, 2005	0.720	1.339E-02
Naphthalene	4.83E-04	USEPA, 1996	5.621	1.618E-01
Nitrobenzene	2.40E-05	USEPA, 1996	0.940	1.748E-02
Nitrosodi-n-propylamine	2.25E-06	USEPA, 1996	nm	nm
Pentachlorophenol	2.44E-08	USEPA, 1996	nm	nm
Tetrachloroethene	1.84E-02	USEPA, 1996	3.979	0.26
Trichloroethene	1.03E-02	USEPA, 1996	8.530	5.74
Vinyl Chloride	2.70E-02	USEPA, 1996	0.365	8.541E-02

## Notes

- = not applicable Inorganic chemical

nm = not modelled as Henry's Law Constant is less than  $1.0 \times 10^{-5}$ , data was not available in J&E model, and/or chemical is Inorganic

(1) = Johnson and Ettinger

(2) = Upper Confidence Level

(3) = Method Detection Limit

(4) = USEPA, May 1996 - Soil Screening Guidance Technical Background Document

(5) = Syracuse Research Council (SRC) PhysProp Database <<http://www.syrres.com/esc/physdemo.htm>>



**TABLE 6-2**  
**COPC CONCENTRATIONS PREDICTED BY GROUNDWATER MODEL**  
**MISSOURI ELECTRIC WORKS**

Compound	Units	Source Concentration Used	Location 1 (Layer 1 Wetland)	Location 2 (Discharge to Creek)	Location 2B (Stream Baseflow Discharge)	Location 3 (Well A)	Location 4 (Well B)	Location 5 (Well C)	Location 6 (Well D) <sup>1</sup>
<b>Modeled Concentration</b>									
Benzene	ug/L	83	0.562	3.35E-02	3.65E-03	75.73	40.34	0.00000146	75.73
Chlorobenzene	ug/L	3200	507	10.91	1.36	2901.18	1351.08	2.48E-05	2901.18
1,3-Dichlorobenzene	ug/L	100	3.42	1.97	0.277	43.99	32.98	1.64E-05	43.99
1,4-Dichlorobenzene	ug/L	120	2.47	2.37	0.333	49.62	39.23	1.81E-05	49.62
TCE	ug/L	13	2.1	0.197	—	5.68	5.23	7.54E-07	5.68
TCE	ug/L	35	5.74	0.512	2.93E-02	15.25	11.6	1.20E-06	15.25
PCE	ug/L	12	0.26	4.13E-02	8.41E-04	5.39	4.32	9.48E-07	5.39
1,2,4-trichlorobenzene	ug/L	65.5	2	0.125	3.42E-03	60.52	40.53	1.96E-06	60.52
Total 1,2-Dichloroethene	ug/L	12	1.5	1.4	0.168	10.97	7.58	1.22E-06	10.97
<b>Normalized Modeled Concentration (C/C<sup>o</sup>)</b>									
Benzo(k) fluoroanthene	unitless	n/a	1.32E-04	2.86E-07	7.52E-09	7.59E-01	6.46E-01	8.90E-08	7.59E-01
Aroclor	unitless	n/a	3.94E-04	6.49E-05	1.71E-06	9.16E-01	6.43E-01	8.90E-08	9.16E-01
Hexochlorobenzene	unitless	n/a	1.02E-03	2.06E-04	5.41E-06	9.16E-01	6.43E-01	8.90E-08	9.16E-01
1,1,2,2-Tetrachloroethane	unitless	n/a	1.86E-02	3.44E-03	1.65E-04	2.09E-01	3.94E-01	9.47E-07	3.94E-01
bis(2-chloroethyl) ether	unitless	n/a	2.34E-01	1.52E-02	8.90E-04	9.36E-01	6.43E-01	8.90E-08	9.36E-01

Note:

— = not modeled

1. Hypothetical well D Modeled concentrations are equal to the highest concentration between Well A or B.



**TABLE 6-4**  
**COPC CONCENTRATIONS PREDICTED BY JOHNSON-ETTINGER MODEL**  
**MISSOURI ELECTRIC WORKS**

Chemical	Vapor Concentration in On-site Building Predicted by J&E Model ug/m <sup>3</sup>	Vapor Concentration in Off-site Building Predicted by J&E Model ug/m <sup>3</sup>
1,1,2,2-Tetrachloroethane	1.96E-04	7.59E-06
1,1,2-Trichloroethane	3.13E-04	9.30E-05
1,1-Dichloroethane	9.75E-02	2.27E-03
Total 1,2 Dichloroethene	6.14E-02	7.42E-03
1,2,4 Trichlorobenzene	2.96E-02	4.09E-03
1,2-Dichloroethane	7.31E-04	1.92E-04
1,2-Dichloropropane	5.35E-04	1.06E-04
1,3-Dichlorobenzene	2.33E-01	8.90E-03
1,4-Dichlorobenzene	2.28E-01	6.16E-03
2,4,6-Trichlorophenol	nm	nm
2,4-Dinitrotoluene	nm	nm
2,6-Dinitrotoluene	nm	nm
2-Chlorophenol	3.93E-03	3.06E-04
3,3-Dichlorobenzidine	nm	nm
4,6-Dinitro-2-Methyl Phenol	nm	nm
Aroclor-1016	4.050E-05	6.760E-08
Aroclor-1221	nm	nm
Aroclor-1232	nm	nm
Aroclor-1242	2.59E-05	3.48E-08
Aroclor-1248	nm	nm
Aroclor-1254	5.92E-05	5.00E-08
Aroclor-1260 (Filtered)	3.26E-03	2.08E-06
Benzene	3.10E-01	2.17E-03
Benzo(a)anthracene	nm	nm
Benzo(a)pyrene	nm	nm
Benzo(b)fluoranthene	7.06E-05	5.21E-08
Benzo(k)fluoranthene	nm	nm
bis(2-Chloroethyl) Ether	3.04E-04	4.11E-04
bis(2-Chloroisopropyl) Ether	nm	nm
Bis (2-ethylhexyl phthalate)	nm	nm
Bromodichloromethane	4.20E-03	1.20E-03
Carbon Tetrachloride	2.52E-03	3.04E-05
Chlorobenzene	9.59E+00	1.52E+00
Chlorodibromomethane	1.49E-04	9.87E-05
Chloroform	1.23E-02	1.13E-02
Dibenzo(a,h)Anthracene	nm	nm



**TABLE 6-4**

**COPC CONCENTRATIONS PREDICTED BY JOHNSON-ETTINGER MODEL**  
**MISSOURI ELECTRIC WORKS**

Chemical	Vapor Concentration in On-site Building Predicted by J&E Model ug/m <sup>3</sup>	Vapor Concentration in Off-site Building Predicted by J&E Model ug/m <sup>3</sup>
Dibenzofuran	5.62E-06	3.25E-04
Hexachloro-1,3-Butadiene	2.63E-03	7.48E-07
Hexachlorobenzene	8.52E-04	1.20E-06
Indeno(1,2,3-cd)Pyrene	nm	nm
2-methylnaphthalene	5.090E-04	2.190E-05
Naphthalene	4.74E-03	2.75E-04
Nitrobenzene	7.64E-05	6.87E-06
Nitrosodi-n-propylamine	nm	nm
Pentachlorophenol	nm	nm
Tetrachloroethene	3.01E-02	1.31E-03
Trichloroethene	2.21E-01	2.50E-02
Vinyl Chloride	6.16E-03	9.36E-04

NOTE:

(1) = Johnson and Ettinger

nm = not modelled as Henry's Law Constant is less than  $1.0 \times 10^{-8}$ , data was not available.

in J&amp;E model, and/or chemical is inorganic



TABLE 6-5  
SUMMARY OF POINT OF EXPOSURE (POE) CONCENTRATIONS FOR RME AND CTE EXPOSURES  
MISSOURI ELECTRIC WORKS

CAS No.	CHEMICAL NAME	Modeled Surrogate	Location 1 (Layer 1 Wetland)			Location 2 (Discharge to Creek)			Location 2B (Surface Water in Creek)			Location 3 (Well A)			Location 4 (Well B)			Location 5 (Well C)			Location 6 (Well D)		
			Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)	Normalized Modeled Concentration (C/C*)	Groundwater Source Concentration (ug/L)	POE Concentration (ug/L)
79-34-5	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1.860E-02	0.235	4.371E-03	3.440E-03	0.235	8.084E-04	1.647E-04	0.235	3.871E-05	2.090E-01	0.235	4.912E-02	3.940E-01	0.235	9.259E-02	9.47E-07	0.235	2.225E-07	3.940E-01	0.235	9.259E-02
79-00-5	1,1,2-Trichloroethane	bs(2-Chloroethyl) Ether	2.340E-01	0.165	3.861E-02	1.520E-02	0.165	2.508E-03	8.904E-04	0.165	1.469E-04	9.360E-01	0.165	1.061E-01	6.430E-01	0.165	1.544E-01	8.90E-08	0.165	1.469E-08	9.360E-01	0.165	1.544E-01
75-34-3	1,1-Dichloroethane	1,1,2,2-Tetrachloroethane	1.860E-02	31	5.766E-01	3.440E-03	31	1.066E-01	1.647E-04	31	5.107E-03	2.090E-01	31	6.479E+00	3.940E-01	31	1.221E+01	9.47E-07	31	2.936E-05	3.940E-01	31	1.221E+01
156-60-5/156-59-2	1,2-Dichloroethane Total	—	—	—	1.5	—	—	1.4	—	—	0.168484251	—	—	10.97	—	—	7.58	—	—	1.220E-04	—	—	10.97
	1,2,4-Trichlorobenzene	—	—	—	2	—	—	0.125	—	—	0.003415705	—	—	60.52	—	—	40.53	—	—	1.960E-06	—	—	60.52
107-06-2	1,2-Dichloroethane	bs(2-Chloroethyl) Ether	2.340E-01	0.29	6.786E-02	1.520E-02	0.29	4.408E-03	8.904E-04	0.29	2.582E-04	9.360E-01	0.29	2.714E-01	6.430E-01	0.29	1.865E-01	8.90E-08	0.29	2.581E-08	9.360E-01	0.29	2.714E-01
78-87-5	1,2-Dichloropropane	bs(2-Chloroethyl) Ether	2.340E-01	0.155	3.627E-02	1.520E-02	0.155	2.356E-03	8.904E-04	0.155	1.380E-04	9.360E-01	0.155	1.451E-01	6.430E-01	0.155	9.967E-02	8.90E-08	0.155	1.380E-08	9.360E-01	0.155	1.451E-01
541-73-1	1,3-Dichlorobenzene	—	—	—	3.42	—	—	1.97	—	—	0.277239592	—	—	43.99	—	—	32.98	—	—	1.64E-05	—	—	43.99
106-47-7	1,4-Dichlorobenzene	—	—	—	2.47	—	—	2.37	—	—	0.332753253	—	—	49.62	—	—	39.23	—	—	1.81E-05	—	—	49.62
88-06-2	2,4,6-Trichlorophenol	1,1,2,2-Tetrachloroethane	1.860E-02	0.49	9.114E-03	3.440E-03	0.49	1.686E-03	1.647E-04	0.49	8.072E-05	2.090E-01	0.49	1.024E-01	3.940E-01	0.49	1.931E-01	9.47E-07	0.49	4.640E-07	3.940E-01	0.49	1.931E-01
121-14-2	2,4-Dinitrotoluene	bs(2-Chloroethyl) Ether	2.340E-01	1.185	2.773E-01	1.520E-02	1.185	1.801E-02	8.904E-04	1.185	1.055E-03	9.360E-01	1.185	1.109E+00	6.430E-01	1.185	7.620E-01	8.90E-08	1.185	1.055E-07	9.360E-01	1.185	1.109E+00
606-20-2	2,6-Dinitrotoluene	1,1,2,2-Tetrachloroethane	1.860E-02	0.675	1.256E-02	3.440E-03	0.675	2.322E-03	1.647E-04	0.675	1.112E-04	2.090E-01	0.675	1.411E-01	3.940E-01	0.675	2.460E-01	9.47E-07	0.675	6.392E-07	3.940E-01	0.675	2.460E-01
95-57-8	2-Chlorophenol	1,1,2,2-Tetrachloroethane	1.860E-02	9.00	1.674E-01	3.440E-03	9.00	3.096E-02	1.647E-04	9.00	1.483E-03	2.090E-01	9.00	1.881E+00	3.940E-01	9.00	3.546E+00	9.47E-07	9.00	8.523E-06	3.940E-01	9.00	3.546E+00
91-94-1	3,3-Dichlorobenzidine	1,1,2,2-Tetrachloroethane	1.860E-02	0.755	1.404E-02	3.440E-03	0.755	2.597E-03	1.647E-04	0.755	1.244E-04	2.090E-01	0.755	1.578E-01	3.940E-01	0.755	2.975E-01	9.47E-07	0.755	7.150E-07	3.940E-01	0.755	2.975E-01
534-52-1	4,6-Dinitro-2-Methyl Phenol	1,1,2,2-Tetrachloroethane	1.860E-02	0.485	9.021E-03	3.440E-03	0.485	1.668E-03	1.647E-04	0.485	7.990E-05	2.090E-01	0.485	1.014E-01	3.940E-01	0.485	4.593E-07	9.47E-07	0.485	4.593E-07	3.940E-01	0.485	1.911E-01
12674-11-2	Aroclor-1016	Aroclor 1232	3.940E-04	0.250	9.850E-05	6.490E-05	0.250	1.623E-05	1.710E-06	0.250	4.276E-07	9.160E-01	0.250	2.290E-01	6.430E-01	0.250	1.608E-01	8.90E-08	0.250	2.225E-08	9.160E-01	0.250	2.290E-01
11104-28-2	Aroclor-1221	Aroclor 1232	3.940E-04	0.145	5.713E-05	6.490E-05	0.145	9.411E-06	1.710E-06	0.145	2.480E-07	9.160E-01	0.145	1.328E-01	6.430E-01	0.145	9.324E-02	8.90E-08	0.145	1.291E-08	9.160E-01	0.145	1.328E-01
11141-16-5	Aroclor-1232	Aroclor 1232	3.940E-04	0.175	6.895E-05	6.490E-05	0.175	1.136E-05	1.710E-06	0.175	2.993E-07	9.160E-01	0.175	1.603E-01	6.430E-01	0.175	1.125E-01	8.90E-08	0.175	1.558E-08	9.160E-01	0.175	1.603E-01
53469-21-9	Aroclor-1242	Aroclor 1232	3.940E-04	0.10	3.940E-05	6.490E-05	0.10	6.490E-06	1.710E-06	0.10	1.710E-07	9.160E-01	0.10	9.160E-02	6.430E-01	0.10	6.430E-02	8.90E-08	0.10	8.900E-09	9.160E-01	0.10	9.160E-02
12672-29-6	Aroclor-1248	Aroclor 1232	3.940E-04	0.065	2.561E-05	6.490E-05	0.065	4.219E-06	1.710E-06	0.065	1.112E-07	9.160E-01	0.065	5.954E-02	6.430E-01	0.065	4.180E-02	8.90E-08	0.065	5.785E-09	9.160E-01	0.065	5.954E-02
11097-69-1	Aroclor-1254	Aroclor 1232	3.940E-04	0.11	4.334E-05	6.490E-05	0.11	7.139E-06	1.710E-06	0.11	1.881E-07	9.160E-01	0.11	1.008E-01	6.430E-01	0.11	7.073E-02	8.90E-08	0.11	9.790E-09	9.160E-01	0.11	1.008E-01
11096-82-5	Aroclor 1260 filtered	Aroclor 1232	3.940E-04	4.50	1.773E-03	6.490E-05	4.50	2.921E-04	1.710E-06	4.50	7.696E-06	9.160E-01	4.50	4.122E+00	6.430E-01	4.50	2.894E+00	8.90E-08	4.50	4.005E-07	9.160E-01	4.50	4.122E+00
71-43-2	Benzene	—	—	—	0.562	—	—	0.0335	—	—	0.0036	—	—	75.73	—	—	40.34	—	—	1.46E-06	—	—	75.73
56-55-3	Benz(a)anthracene	Aroclor 1232	3.940E-04	0.71	2.797E-04	6.490E-05	0.71	4.608E-05	1.710E-06	0.71	1.214E-06	9.160E-01	0.71	6.504E-01	6.430E-01	0.71	4.565E-01	8.90E-08	0.71	6.319E-08	9.160E-01	0.71	6.504E-01
50-32-8	Benz(a)pyrene	Aroclor 1232	3.940E-04	0.66	2.600E-04	6.490E-05	0.66	4.283E-05	1.710E-06	0.66	1.129E-06	9.160E-01	0.66	6.046E-01	6.430E-01	0.66	4.244E-01	8.90E-08	0.66	5.874E-08	9.160E-01	0.66	6.046E-01
205-99-2	Benz(b)fluoranthene	Benz(a) fluoranthene	1.320E-04	1.215	1.604E-04	2.860E-07	1.215	3.475E-07	7.522E-09	1.215	9.139E-09	7.590E-01	1.215	7.849E-01	6.460E-01	1.215	7.849E-01	8.90E-08	1.215	1.081E-07	7.590E-01	1.215	9.222E-01
207-08-9	Benz(k)fluoranthene	Benz(a) fluoranthene	1.320E-04	0.70	9.240E-05	2.860E-07	0.70	2.002E-07	7.522E-09	0.70	5.265E-09	7.590E-01	0.70	5.313E-01	6.460E-01	0.70	4.522E-01	8.90E-08	0.70	6.230E-08	7.590E-01	0.70	5.313E-01
111-44-4	bs(2-Chloroethyl) Ether	bs(2-Chloroethyl) Ether	2.340E-01	6.00	1.404E+00	1.520E-02	6.00	9.120E-02	8.904E-04	6.00	5.343E-03	9.360E-01	6.00	5.616E+00	6.430E-01	6.00	3.858E+00	8.90E-08	6.00	5.340E-07	9.360E-01	6.00	5.616E+00
108-60-1	bs(2-Chloropropyl) Ether	bs(2-Chloroethyl) Ether	2.340E-01	0.87	2.036E-01	1.520E-02	0.87	1.322E-02	8.904E-04	0.87	7.747E-04	9.360E-01	0.87	8.143E-01	6.430E-01	0.87	5.594E-01	8.90E-08	0.87	7.743E-08	9.360E-01	0.87	8.143E-01
117-81-7	Bis(2-ethylhexyl)phthalate	Aroclor 1232	3.940E-04	120	4.728E-02	6.490E-05	120	7.788E-03	1.710E-06	120	2.052E-04	9.160E-01	120	1.099E+02	6.430E-01	120	7.716E+01	8.90E-08	120	1.068E-05	9.160E-01	120	1.099E+02
75-27-4	Bromodichloromethane	bs(2-Chloroethyl) Ether	2.340E-01	2.50	5.850E-01	1.520E-02	2.50	3.800E-02	8.904E-04	2.50	2.226E-03	9.360E-01	2.50	2.340E+00	6.430E-01	2.50	1.608E+00	8.90E-08	2.50	2.225E-07	9.360E-01	2.50	2.340E+00
56-23-5	Carbon Tetrachloride	1,1,2,2-Tetrachloroethane	1.860E-02	0.21	3.906E-03	3.440E-03	0.21	7.224E-04	1.647E-04	0.21	3.460E-05	2.090E-01	0.21	4.389E-02	3.940E-01	0.21	8.274E-02	9.47E-07	0.21	1.989E-07	3.940E-01	0.21	8.274E-02
108-90-7	Chlorobenzene	—	—	—	507	—	—	10.91	—	—	1.36	—	—	2901.18	—	—	1351.08	—	—	2.48E-05	—	—	2901.18
124-48-1	Chlorodibromomethane	bs(2-Chloroethyl) Ether	2.340E-01	0.205	4.797E-02	1.520E-02	0.205	3.116E-03	8.904E-04	0.205	1.825E-04	9.360E-01	0.205	1.919E-01	6.430E-4								



**TABLE 7-1**  
**CONTAMINANT SPECIFIC DERMAL EXPOSURE PARAMETERS**  
**MISSOURI ELECTRIC WORKS**

Parameter Symbol Units	Lag time per event for -event hr	Time to reach steady state †* hr	Fraction absorbed dose FA dimensionless	Dermal permeability coefficient for compound in water Kp cm/hr	Dimensionless ratio B dimensionless
<b>Compound</b>					
Benzo(a)pyrene	2.69	6.46	1	7.00E-01	4.30E+00
Benzo(b)fluoranthene	2.77	6.65	1	7.00E-01	4.30E+00
Benzo(k)fluoranthene	2.77	12.02	1	6.90E-01	4.22E+00
bis(2-Chloroethyl) Ether	0.68	1.62	1	1.78E-03	8.17E-03
bis(2-Chloroisopropyl) Ether	0.97	2.33	1	5.20E-02	2.60E-01
Bis (2-ethylhexyl phthalate)	16.64	39.93	0.8	2.49E-02	1.90E-01
Bromodichloromethane	0.88	2.12	1	4.62E-03	2.27E-02
Carbon Tetrachloride	0.78	1.86	1	1.63E-02	7.78E-02
Chlorobenzene	0.46	1.09	1	2.82E-02	1.15E-01
Chlorodibromomethane	1.57	3.77	1	3.22E-03	1.79E-02
Chloroform	0.50	1.19	1	6.83E-03	2.87E-02
Dibenzo(a,h)Anthracene	3.88	9.32	0.6	1.51E+00	9.68E+00
Dibenzofuran	0.94	2.24	1	9.80E-02	4.90E-01
Hexachloro-1,3-Butadiene	3.09	7.42	0.9	8.09E-02	5.03E-01
Hexachlorobenzene	4.22	10.12	0.9	1.34E-01	8.67E-01
Indeno(1,2,3-cd)Pyrene	3.78	9.07	0.6	1.04E+00	6.65E+00
2-methylnaphthalene	0.67	1.60	1	9.20E-02	4.20E-01
Naphthalene	0.56	1.34	1	4.66E-02	2.03E-01
Nitrobenzene	0.52	1.25	1	5.40E-03	2.00E-02
Nitrosodi-n-propylamine	0.57	1.37	1	2.33E-03	1.02E-02
Pentachlorophenol	3.33	7.99	0.9	3.90E-01	2.50E+00
Tetrachloroethene	0.91	2.18	1	3.34E-02	1.66E-01
Trichloroethene	0.58	1.39	1	1.16E-02	5.13E-02
Vinyl Chloride	0.24	0.57	1	5.60E-03	1.70E-02



**TABLE 7-1**  
**CONTAMINANT SPECIFIC DERMAL EXPOSURE PARAMETERS**  
**MISSOURI ELECTRIC WORKS**

Parameter Symbol Units	Lag time per event for -event hr	Time to reach steady state t* hr	Fraction absorbed dose FA dimensionless	Dermal permeability coefficient for compound in water Kp cm/hr	Dimensionless ratio B dimensionless
<b>Compound</b>					
1,1,2,2-Tetrachloroethane	0.93	2.24	1	6.94E-03	3.46E-02
1,1,2-Trichloroethane	0.60	1.43	1	6.44E-03	2.86E-02
1,1-Dichloroethane	0.38	0.92	1	6.74E-03	2.58E-02
Total 1,2 Dichloroethene	0.37	0.89	1	7.71E-03	2.92E-02
1,2,4 Trichlorobenzene	1.11	2.66	1	6.63E-02	3.43E-01
1,2-Dichloroethane	0.38	0.92	1	4.20E-03	1.61E-02
1,2-Dichloropropane	0.46	1.10	1	7.76E-03	3.17E-02
1,3-Dichlorobenzene	0.71	1.71	1	5.79E-02	2.70E-01
1,4-Dichlorobenzene	0.71	1.71	1	4.20E-02	1.96E-01
2,4,6-Trichlorophenol	1.36	3.27	1	3.46E-02	1.87E-01
2,4-Dinitrotoluene	1.12	2.69	1	3.10E-03	0.00E+00
2,6-Dinitrotoluene	1.12	2.69	1	2.10E-03	0.00E+00
2-Chlorophenol	0.56	1.34	1	7.99E-03	3.48E-02
3,3-Dichlorobenzidine	2.80	6.72	1	1.28E-02	7.83E-02
4,6-Dinitro-2-Methyl Phenol	1.38	3.30	1	3.10E-03	2.00E-02
Aroclor-1016	2.97	12.03	1	3.10E-01	1.88E+00
Aroclor-1221	1.22	4.7	1	1.40E-01	7.40E-01
Aroclor-1232	1.22	4.7	1	1.40E-01	7.40E-01
Aroclor-1242	4.63	19.83	1	5.50E-01	3.58E+00
Aroclor-1248	4.63	19.94	1	5.90E-01	3.87E+00
Aroclor-1254	7.22	31.74	1	7.50E-01	5.22E+00
Aroclor-1260 (Filtered)	17.6	81.43	1	3.00E+00	2.27E+01
Benzene	0.29	0.70	1	1.49E-02	5.05E-02
Benzo(a)anthracene	2.03	4.87	1	4.70E-01	2.80E+00



TABLE 7-2  
RME RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern															
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	3.93E-03	3.93E-03	0.00E+00	0.00E+00
				POE concentration	C <sub>air</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	3.93E-06	3.93E-06	0.00E+00	0.00E+00
				Inhalation rate	IR	m3/hr	2															
				Exposure time	ET	h/d	10															
				Exposure frequency	EF	d/y	250															
				Exposure duration	ED	y	25															
				Body weight	BW	kg	70															
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550															
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	9,125															
				Average Intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		1.36984E-08	2.18759E-08	6.81437E-06	4.29131E-06	2.06877E-06	5.10903E-08	3.73917E-08	1.62846E-05	1.59351E-05	0	0	2.74672E-07	2.74672E-07	0	0
				Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02					
				Risk	R	fraction		2.78E-09	1.25E-09				4.65E-09			3.51E-07	0.00E+00					
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																
				Average Intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		3.83562E-08	6.12524E-08	1.90802E-05	1.20157E-05	5.79256E-06	1.43053E-07	1.04697E-07	4.59969E-05	4.46184E-05	0	0	7.6908E-07	7.6908E-07	0	0
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01						
				Hazard Quotient	HQ	mg/kg-d						0.005081196	0.000102181	9.18392E-05		0.000193993						
				Total Hazard Index	HI	mg/kg-d																
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction		2.78E-09	1.25E-09	0.00E+00	0.00E+00	0.00E+00	4.65E-09	0.00E+00	0.00E+00	3.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0.005081196	0.000102181	9.18392E-05	0	0.000193993	0	0	0	0	0	0	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-2  
RME RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane
Vapour Intrusion - Inhalation	POE concentration	C <sub>air-in</sub>	ug/m3	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00	1.49E-04
	POE concentration	C <sub>air-in</sub>	mg/m3	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03	1.49E-07
	Inhalation rate	IR	m3/hr																			
	Exposure time	ET	h/d																			
	Exposure frequency	EF	d/y																			
	Exposure duration	ED	y																			
	Body weight	BW	kg																			
	Averaging time carcinogens	AT <sub>c</sub>	d																			
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																			
	Average Intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d	2.83058E-09	0	0	1.81018E-09	0	4.13755E-09	2.27845E-07	2.16662E-05	0	0	4.9343E-09	0	2.12469E-08	0	0	2.93542E-07	1.76125E-07	0.000670254	1.04138E-08
	Inhalation Cancer Slope Factor	CSF <sub>a</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00			5.20E-02			
	Risk	R	fraction	1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	2.46E-08			9.16E-09			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
	Average Intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	7.92564E-09	0	0	5.06849E-09	0	1.15851E-08	6.37965E-07	6.06654E-05	0	0	1.3816E-08	0	5.94912E-08	0	0	8.21918E-07	4.93151E-07	0.001876712	2.91585E-08
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d								8.57E-03										1.70E-02	
	Hazard Quotient	HQ	mg/kg-d								0.007078805										0.110394843	
	Total Hazard Index	HI	mg/kg-d																			
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES																						
	Sum Ri	fraction		1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	2.46E-08	0.00E+00	0.00E+00	0.00E+00	9.16E-09	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES																						
	Sum HI	fraction		0	0	0	0	0	0	0	0.007078805	0	0	0	0	0	0	0	0	0	0.110394843	0



TABLE 7-2  
RME RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																																
Exposure Route	Parameter	Symbol	Units	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution																	
Vapour Intrusion - Inhalation	POE concentration	C <sub>po,inh</sub>	ug/m3	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03																			
	POE concentration	C <sub>po,inh</sub>	mg/m3	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06																			
	Inhalation rate	IR	m3/hr																																	
	Exposure time	ET	h/d																																	
	Exposure frequency	EF	d/y																																	
	Exposure duration	ED	y																																	
	Body weight	BW	kg																																	
	Averaging time carcinogens	AT <sub>c</sub>	d																																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																																	
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	8.59659E-07	0	3.92787E-10	1.83813E-07	5.95471E-08	0	3.55745E-08	3.31283E-07	5.33967E-09	0	0	2.10372E-06	1.54459E-05	4.30528E-07																			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	4.00E-01	3.00E-02																			
	Risk	R	fraction	6.96E-08	0.00E+00		1.42E-08	9.59E-08	0.00E+00						4.42E-06	6.18E-06	1.29E-08		1.19E-05	100%																
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																																	
	Average intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	2.40705E-06	0	1.0998E-09	5.14677E-07	1.66732E-07	0	9.96086E-08	9.27593E-07	1.49511E-08	0	0	5.89041E-06	4.32485E-05	1.20548E-06																			
	Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d								8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02																			
	Hazard Quotient	HQ	mg/kg-d							0.001082372	2.6184E-05				4.20744E-05	0.003793731	4.21496E-05		1.28E-01	100%																
	Total Hazard Index	HI	mg/kg-d																																	
Carcinogenic risk - all routes (detected organics)																			1.17E-05																	
Carcinogenic risk - all routes (undetected organics)																			1.45E-07																	
TOTAL CARCINOGENIC RISK - ALL ROUTES																			Sum R <sub>i</sub>	fraction	6.96E-08	0.00E+00	0.00E+00	1.42E-08	9.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-06	6.18E-06	1.29E-08	1.19E-05	
Non-Carcinogenic risk - all routes (detected organics)																																			1.28E-01	
Non-Carcinogenic risk - all routes (undetected organics)																																			2.62E-04	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES																			Sum H <sub>i</sub>	fraction	0	0	0	0	0	0	0	0.001082372	2.6184E-05	0	0	4.20744E-05	0.003793731	4.21496E-05	1.28E-01	



TABLE 7-3  
RME RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern															
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	3.93E-03	3.93E-03	0.00E+00	0.00E+00
				POE concentration	C <sub>POE</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	3.93E-06	3.93E-06	0.00E+00	0.00E+00
				Inhalation rate	IR	m3/hr	2															
				Exposure time	ET	h/d	10															
				Exposure frequency	EF	d/y	250															
				Exposure duration	ED	y	25															
				Body weight	BW	kg	70															
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550															
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	9,125															
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		1.36984E-08	2.18759E-08	6.81437E-06	4.29131E-06	2.06877E-06	5.10903E-08	3.73917E-08	1.62846E-05	1.59351E-05	0	0	2.74672E-07	2.74672E-07	0	0
				Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02					
				Risk	R	fraction		2.78E-09	1.25E-09				4.65E-09			3.51E-07	0.00E+00					
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																
				Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		3.83562E-08	6.12524E-08	1.90802E-05	1.20157E-05	5.79256E-06	1.43053E-07	1.04697E-07	4.55969E-05	4.46184E-05	0	0	7.6908E-07	7.6908E-07	0	0
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01						
				Hazard Quotient	HQ	mg/kg-d						0.005081196	0.000102181	9.18392E-05		0.000193993						
				Total Hazard Index	HI	mg/kg-d																
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		2.78E-09	1.25E-09	0.00E+00	0.00E+00	0.00E+00	4.65E-09	0.00E+00	0.00E+00	3.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0.005081196	0.000102181	9.18392E-05	0	0.000193993	0	0	0	0	0	0	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-3  
RME RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl) phthalate	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00	1.49E-04
	POE concentration	C <sub>air</sub>	mg/m3	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03	1.49E-07
	Inhalation rate	IR	m3/hr																			
	Exposure time	ET	h/d																			
	Exposure frequency	EF	d/y																			
	Exposure duration	ED	y																			
	Body weight	BW	kg																			
	Averaging time carcinogens	AT <sub>c</sub>	d																			
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																			
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	2.83058E-09	0	0	1.81018E-09	0	4.13755E-09	2.27845E-07	2.16662E-05	0	0	4.9343E-09	0	2.12469E-08	0	0	2.93542E-07	1.76125E-07	0.000670254	1.04138E-08
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00			5.20E-02			
	Risk	R <sub>i</sub>	fraction	1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	2.46E-08			9.16E-09			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
	Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	7.92564E-09	0	0	5.06849E-09	0	1.15851E-08	6.37965E-07	6.06654E-05	0	0	1.3816E-08	0	5.94912E-08	0	0	8.21918E-07	4.93151E-07	0.001876712	2.91585E-08
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d								8.57E-03										1.70E-02	
	Hazard Quotient	HQ	mg/kg-d								0.007078805										0.110394843	
	Total Hazard Index	HI	mg/kg-d																			
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction	1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	2.46E-08	0.00E+00	0.00E+00	9.16E-09	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0.007078805	0	0	0	0	0	0	0	0	0.110394843	0



TABLE 7-3  
RME RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																
Exposure Route	Parameter	Symbol	Units	Chloroform	Dibenzo(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03			
	POE concentration	C <sub>air</sub>	mg/m3	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06			
	Inhalation rate	IR	m3/hr																	
	Exposure time	ET	h/d																	
	Exposure frequency	EF	d/y																	
	Exposure duration	ED	y																	
	Body weight	BW	kg																	
	Averaging time carcinogens	AT <sub>c</sub>	d																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Average intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	8.59659E-07	0	3.92787E-10	1.83813E-07	5.95471E-08	0	3.55745E-08	3.31283E-07	5.33967E-09	0	0	2.10372E-06	1.54459E-05	4.30528E-07			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	6.96E-08	0.00E+00		1.42E-08	9.59E-08	0.00E+00						4.42E-06	3.09E-07	1.29E-08	6.00E-06	100%	
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																	
	Average intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	2.40705E-06	0	1.0998E-09	5.14677E-07	1.66732E-07	0	9.96086E-08	9.27593E-07	1.49511E-08	0	0	5.89041E-06	4.32485E-05	1.20548E-06			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d								8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d							0.001082372	2.6184E-05				4.20744E-05	0.003793731	4.21496E-05	1.28E-01	100%	
	Total Hazard Index	HI	mg/kg-d																	
Carcinogenic risk - all routes (detected organics)																		5.85E-06		
Carcinogenic risk - all routes (undetected organics)																		1.45E-07		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>c</sub>	fraction	6.96E-08	0.00E+00	0.00E+00	1.42E-08	9.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-06	3.09E-07	1.29E-08	6.00E-06	
Non-Carcinogenic risk - all routes (detected organics)																		1.28E-01		
Non-Carcinogenic risk - all routes (undetected organics)																		2.62E-04		
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0.001082372	2.6184E-05	0	0	4.20744E-05	0.003793731	4.21496E-05	1.28E-01	



TABLE 7-4  
RME RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern															
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	3.93E-03	3.93E-03	0.00E+00	0.00E+00
				POE concentration	C <sub>air</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	3.93E-06	3.93E-06	0.00E+00	0.00E+00
				Inhalation rate	IR	m3/hr	2															
				Exposure time	ET	h/d	10															
				Exposure frequency	EF	d/y	250															
				Exposure duration	ED	y	25															
				Body weight	BW	kg	70															
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550															
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	9,125															
				Average Intake from Inhalation carcinogens	I <sub>h</sub>	mg/kg-d		1.36984E-08	2.18759E-08	6.81437E-06	4.29131E-06	2.06877E-06	5.10903E-08	3.73917E-08	1.62846E-05	1.59351E-05	0	0	2.74672E-07	2.74672E-07	0	0
				Inhalation Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02					
				Risk	R	fraction		2.78E-09	1.25E-09				4.65E-09			3.51E-07	0.00E+00					
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		3.83562E-08	6.12524E-08	1.90802E-05	1.20157E-05	5.79256E-06	1.43053E-07	1.04697E-07	4.55969E-05	4.46184E-05	0	0	7.6908E-07	7.6908E-07	0	0
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01						
				Hazard Quotient	HQ	mg/kg-d						0.005081196	0.000102181	9.18392E-05		0.000193993						
				Total Hazard Index	HI	mg/kg-d																
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		2.78E-09	1.25E-09	0.00E+00	0.00E+00	0.00E+00	4.65E-09	0.00E+00	0.00E+00	3.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0.005081196	0.000102181	9.18392E-05	0	0.000193993	0	0	0	0	0	0	

Notes:  
1- ug/l = micrograms per Liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-4  
RME RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane
Vapour Intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00	1.49E-04
	POE concentration	C <sub>POE</sub>	mg/m3	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03	1.49E-07
	Inhalation rate	IR	m3/hr																			
	Exposure time	ET	h/d																			
	Exposure frequency	EF	d/y																			
	Exposure duration	ED	y																			
	Body weight	BW	kg																			
	Averaging time carcinogens	AT <sub>c</sub>	d																			
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																			
	Average Intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d	2.83058E-09	0	0	1.81018E-09	0	4.13755E-09	2.27845E-07	2.16662E-05	0	0	4.9343E-09	0	2.12469E-08	0	0	2.93542E-07	1.76125E-07	0.000670254	1.04138E-08
	Inhalation Cancer Slope Factor	CSF <sub>a</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00			5.20E-02			
	Risk	R <sub>i</sub>	fraction	1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	2.46E-08	0.00E+00	0.00E+00	9.16E-09	0.00E+00	0.00E+00	0.00E+00
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
	Average Intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	7.92564E-09	0	0	5.06849E-09	0	1.15851E-08	6.37965E-07	6.06654E-05	0	0	1.3816E-08	0	5.94912E-08	0	0	8.21918E-07	4.93151E-07	0.001876712	2.91585E-08
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d								8.57E-03										1.70E-02	
	Hazard Quotient	HQ	mg/kg-d								0.007078805										0.110394843	
	Total Hazard Index	HI	mg/kg-d																			
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction	1.13E-09	0.00E+00	0.00E+00	7.24E-10	0.00E+00	1.66E-09	9.11E-08	5.91E-07	0.00E+00	0.00E+00	1.52E-09	0.00E+00	0.00E+00	0.00E+00	9.16E-09	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0.007078805	0	0	0	0	0	0	0	0	0.110394843	0



TABLE 7-4  
RME RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																
Exposure Route	Parameter	Symbol	Units	Chloroform	Dibenzo(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour intrusion - inhalation	POE concentration	C <sub>o,inh</sub>	ug/m3	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03	5.78E-06	100%	
	POE concentration	C <sub>o,inh</sub>	mg/m3	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06			
	Inhalation rate	IR	m3/hr																	
	Exposure time	ET	h/d																	
	Exposure frequency	EF	d/y																	
	Exposure duration	ED	y																	
	Body weight	BW	kg																	
	Averaging time carcinogens	AT <sub>c</sub>	d																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	8.59659E-07	0	3.92787E-10	1.83813E-07	5.95471E-08	0	3.55745E-08	3.31283E-07	5.33967E-09	0	0	2.10372E-06	1.54459E-05	4.30528E-07			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R <sub>i</sub>	fraction	6.96E-08	0.00E+00		1.42E-08	9.59E-08	0.00E+00						4.42E-06	9.27E-08	1.29E-08			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction															5.78E-06		
	Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	2.40705E-06	0	1.0998E-09	5.14677E-07	1.66732E-07	0	9.96086E-08	9.27593E-07	1.49511E-08	0	0	5.89041E-06	4.32485E-05	1.20548E-06			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d								8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d							0.001082372	2.6184E-05				4.20744E-05	0.003793731	4.21496E-05			
	Total Hazard Index	HI	mg/kg-d															1.28E-01		
Carcinogenic risk - all routes (detected organics)																		5.64E-06		
Carcinogenic risk - all routes (undetected organics)																		1.45E-07		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction	6.96E-08	0.00E+00	0.00E+00	1.42E-08	9.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-06	9.27E-08	1.29E-08	5.78E-06	
Non-Carcinogenic risk - all routes (detected organics)																			1.28E-01	
Non-Carcinogenic risk - all routes (undetected organics)																			2.62E-04	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0.001082372	2.6184E-05	0	0	4.20744E-05	0.003793731	4.21496E-05	1.28E-01	



TABLE 7-5  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern															
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	0.00E+00	3.93E-03	0.00E+00	
				POE concentration	C <sub>air</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	0.00E+00	3.93E-06	0.00E+00	
				Inhalation rate	IR	m3/hr	1.6															
				Exposure time	ET	h/d	10															
				Exposure frequency	EF	d/y	219															
				Exposure duration	ED	y	6.6															
				Body weight	BW	kg	70															
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550															
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,409															
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		2.5344E-09	4.04728E-09	1.26073E-06	7.9394E-07	3.82746E-07	9.45228E-09	6.91788E-09	3.01283E-06	2.94818E-06	0	0	0	5.08173E-08	0	
				Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02					
				Risk	R	fraction		5.14E-10	2.31E-10				8.60E-10			6.49E-08	0.00E+00					
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																
				Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		2.688E-08	4.29257E-08	1.33714E-05	8.42057E-06	4.05943E-06	1.00251E-07	7.33714E-08	3.19543E-05	3.12686E-05	0	0	0	5.38971E-07	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01						
				Hazard Quotient	HQ	mg/kg-d						0.003560902	7.16082E-05	6.43609E-05		0.00013595						
				Total Hazard Index	HI	mg/kg-d																
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		5.14E-10	2.31E-10	0.00E+00	0.00E+00	0.00E+00	8.60E-10	0.00E+00	0.00E+00	6.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0.003560902	7.16082E-05	6.43609E-05	0	0.00013595	0	0	0	0	0		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-5  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03
	Inhalation rate	IR	m3/hr																			
	Exposure time	ET	h/d																			
	Exposure frequency	EF	d/y																			
	Exposure duration	ED	y																			
	Body weight	BW	kg																			
	Averaging time carcinogens	AT <sub>c</sub>	d																			
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																			
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	5.2369E-10	0	0	3.34903E-10	0	7.65492E-10	4.21538E-08	4.00849E-06	0	0	9.12901E-10	0	3.93091E-09	0	0	5.43086E-08	3.25851E-08	0.000124005
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02	1.16E+00
	Risk	R <sub>i</sub>	fraction		2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09				1.69E-09	0.00E+00
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
	Average Intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	5.55429E-09	0	0	3.552E-09	0	8.11886E-09	4.47086E-07	4.25143E-05	0	0	9.68229E-09	0	4.16914E-08	0	0	0.000000576	3.456E-07	0.0013152
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d									8.57E-03										1.70E-02
	Hazard Quotient	HQ	mg/kg-d									0.004960827										0.077364706
	Total Hazard Index	HI	mg/kg-d																			
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES		Sum Ri	fraction	0.00E+00	2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09	0.00E+00	0.00E+00	0.00E+00	1.69E-09	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES		Sum HI	fraction	0	0	0	0	0	0	0	0	0.004960827	0	0	0	0	0	0	0	0	0	0.077364706



TABLE 7-5  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																	
Exposure Route	Parameter	Symbol	Units	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenz(a,l)Anthracene	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	1.49E-04	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03			
	POE concentration	C <sub>POE</sub>	mg/m3	1.49E-07	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06			
	Inhalation rate	IR	m3/hr																		
	Exposure time	ET	h/d																		
	Exposure frequency	EF	d/y																		
	Exposure duration	ED	y																		
	Body weight	BW	kg																		
	Averaging time carcinogens	AT <sub>c</sub>	d																		
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																		
	Average Intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d	1.92666E-09	1.59047E-07	0	7.267E-11	3.40075E-08	1.10169E-08	0	6.58168E-09	6.12911E-08	9.87899E-10	0	0	3.89211E-07	2.85767E-06	7.96526E-08			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction		1.29E-08	0.00E+00		2.62E-09	1.77E-08	0.00E+00						8.17E-07	1.14E-06	2.39E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																	2.20E-06	100%
	Average Intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	2.04343E-08	1.68686E-06	0	7.70743E-10	3.60686E-07	1.16846E-07	0	6.98057E-08	6.50057E-07	1.04777E-08	0	0	0.000004128	3.03086E-05	8.448E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d										8.57E-04	5.71E-04		1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d										0.000758526	1.83498E-05		2.94857E-05	0.002658647	2.95385E-05			
	Total Hazard Index	HI	mg/kg-d																	8.97E-02	100%
Carcinogenic risk - all routes (detected organics)																			2.17E-06		
Carcinogenic risk - all routes (undetected organics)																			2.68E-08		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	0.00E+00	1.29E-08	0.00E+00	0.00E+00	2.62E-09	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.17E-07	1.14E-06	2.39E-09	2.20E-06	
Non-Carcinogenic risk - all routes (detected organics)																				8.95E-02	
Non-Carcinogenic risk - all routes (undetected organics)																				1.84E-04	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0	0.000758526	1.83498E-05	0	0	2.94857E-05	0.002658647	2.95385E-05	8.97E-02	



TABLE 7-6  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE ICE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern														
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	0.00E+00	3.93E-03	0.00E+00
				POE concentration	C <sub>POE</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	0.00E+00	3.93E-06	0.00E+00
				Inhalation rate	IR	m3/hr	1.6														
				Exposure time	ET	h/d	10														
				Exposure frequency	EF	d/y	219														
				Exposure duration	ED	y	6.6														
				Body weight	BW	kg	70														
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550														
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,409														
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		2.5344E-09	4.04728E-09	1.26073E-06	7.9394E-07	3.82746E-07	9.45228E-09	6.91788E-09	3.01283E-06	2.94818E-06	0	0	0	5.08173E-08	0
				Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02				
				Risk	R	fraction		5.14E-10	2.31E-10				8.60E-10			6.49E-08	0.00E+00				
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction															
				Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		2.688E-08	4.29257E-08	1.33714E-05	8.42057E-06	4.05943E-06	1.00251E-07	7.33714E-08	3.19543E-05	3.12686E-05	0	0	0	5.38971E-07	0
				Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01					
				Hazard Quotient	HQ	mg/kg-d						0.003560902	7.16082E-05	6.43609E-05		0.00013595					
				Total Hazard Index	HI	mg/kg-d															
Carcinogenic risk - all routes (detected organics)																					
Carcinogenic risk - all routes (undetected organics)																					
TOTAL CARCINOGENIC RISK - ALL ROUTES					Sum Ri	fraction		5.14E-10	2.31E-10	0.00E+00	0.00E+00	0.00E+00	8.60E-10	0.00E+00	0.00E+00	6.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																					
Non-Carcinogenic risk - all routes (undetected organics)																					
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES					Sum HI	fraction		0	0	0	0	0.003560902	7.16082E-05	6.43609E-05	0	0.00013595	0	0	0	0	0

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-6  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene
Vapour Intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	0.00E+00	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00
	POE concentration	C <sub>POE</sub>	mg/m3	0.00E+00	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03
	Inhalation rate	IR	m3/hr																			
	Exposure time	ET	h/d																			
	Exposure frequency	EF	d/y																			
	Exposure duration	ED	y																			
	Body weight	BW	kg																			
	Averaging time carcinogens	AT <sub>c</sub>	d																			
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																			
	Average intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	5.2369E-10	0	0	3.34903E-10	0	7.65492E-10	4.21538E-08	4.00849E-06	0	0	9.12901E-10	0	3.93091E-09	0	0	5.43086E-08	3.25851E-08	0.000124005
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02	
	Risk	R	fraction		2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09				1.69E-09	
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																			
	Average intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	5.55429E-09	0	0	3.552E-09	0	8.11886E-09	4.47086E-07	4.25143E-05	0	0	9.68229E-09	0	4.16914E-08	0	0	0.000000576	3.456E-07	0.0013152
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d									8.57E-03										1.70E-02
	Hazard Quotient	HQ	mg/kg-d									0.004960827										0.077364706
	Total Hazard Index	HI	mg/kg-d																			
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>c</sub>	fraction	0.00E+00	2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09	0.00E+00	1.69E-09	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0.004960827	0	0	0	0	0	0	0	0	0	0.077364706



TABLE 7-6  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																	
Exposure Route	Parameter	Symbol	Units	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour Intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	1.49E-04	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03			
	POE concentration	C <sub>POE</sub>	mg/m3	1.49E-07	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06			
	Inhalation rate	IR	m3/hr																		
	Exposure time	ET	h/d																		
	Exposure frequency	EF	d/y																		
	Exposure duration	ED	y																		
	Body weight	BW	kg																		
	Averaging time carcinogens	AT <sub>c</sub>	d																		
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																		
	Average intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d	1.92666E-09	1.59047E-07	0	7.267E-11	3.40075E-08	1.10169E-08	0	6.58168E-09	6.12911E-08	9.87899E-10	0	0	3.89211E-07	2.85767E-06	7.96526E-08			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction		1.29E-08	0.00E+00		2.62E-09	1.77E-08	0.00E+00						8.17E-07	5.72E-08	2.39E-09	1.11E-06	100%	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
	Average intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	2.04343E-08	1.68686E-06	0	7.70743E-10	3.60686E-07	1.16846E-07	0	6.98057E-08	6.50057E-07	1.04777E-08	0	0	0.000004128	3.03086E-05	8.448E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d													1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d									0.000758526	5.71E-04			2.94857E-05	0.002658647	2.95385E-05			
	Total Hazard Index	HI	mg/kg-d																8.97E-02	100%	
Carcinogenic risk - all routes (detected organics)																			1.08E-06		
Carcinogenic risk - all routes (undetected organics)																			2.68E-08		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum RI	fraction	0.00E+00	1.29E-08	0.00E+00	0.00E+00	2.62E-09	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.17E-07	5.72E-08	2.39E-09	1.11E-06	
Non-Carcinogenic risk - all routes (detected organics)																			8.95E-02		
Non-Carcinogenic risk - all routes (undetected organics)																			1.84E-04		
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0	0.000758526	1.83498E-05	0	0	2.94857E-05	0.002658647	2.95385E-05	8.97E-02	



TABLE 7-7  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern															
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		1.96E-04	3.13E-04	9.75E-02	6.14E-02	2.96E-02	7.31E-04	5.35E-04	2.33E-01	2.28E-01	0.00E+00	0.00E+00	0.00E+00	3.93E-03	0.00E+00	
				POE concentration	C <sub>air</sub>	mg/m3		1.96E-07	3.13E-07	9.75E-05	6.14E-05	2.96E-05	7.31E-07	5.35E-07	2.33E-04	2.28E-04	0.00E+00	0.00E+00	0.00E+00	3.93E-06	0.00E+00	
				Inhalation rate	IR	m3/hr	1.6															
				Exposure time	ET	h/d	10															
				Exposure frequency	EF	d/y	219															
				Exposure duration	ED	y	6.6															
				Body weight	BW	kg	70															
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550															
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,409															
				Average Intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d		2.5344E-09	4.04728E-09	1.26073E-06	7.9394E-07	3.82746E-07	9.45228E-09	6.91788E-09	3.01283E-06	2.94818E-06	0	0	0	5.08173E-08	0	
				Inhalation Cancer Slope Factor	CSF <sub>a</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02					
				Risk	R	fraction		5.14E-10	2.31E-10				8.60E-10			6.49E-08	0.00E+00					
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																
				Average Intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d		2.688E-08	4.29257E-08	1.33714E-05	8.42057E-06	4.05943E-06	1.00251E-07	7.33714E-08	3.19543E-05	3.12686E-05	0	0	0	5.38971E-07	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01						
				Hazard Quotient	HQ	mg/kg-d						0.003560902	7.16082E-05	6.43609E-05		0.00013595						
				Total Hazard Index	HI	mg/kg-d																
Carcinogenic risk - all routes (detected organics)																						
Carcinogenic risk - all routes (undetected organics)																						
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		5.14E-10	2.31E-10	0.00E+00	0.00E+00	0.00E+00	8.60E-10	0.00E+00	0.00E+00	0.00E+00	6.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																						
Non-Carcinogenic risk - all routes (undetected organics)																						
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0.003560902	7.16082E-05	6.43609E-05	0	0.00013595	0	0	0	0	0	0	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- m3/hr = cubic meter per hour  
13- mg/m3 = milligrams per cubic meter



TABLE 7-7  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																			
Exposure Route	Parameter	Symbol	Units	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	4.05E-05	0.00E+00	0.00E+00	2.59E-05	0.00E+00	5.92E-05	3.26E-03	3.10E-01	0.00E+00	0.00E+00	7.06E-05	0.00E+00	3.04E-04	0.00E+00	0.00E+00	4.20E-03	2.52E-03	9.59E+00	
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	4.05E-08	0.00E+00	0.00E+00	2.59E-08	0.00E+00	5.92E-08	3.26E-06	3.10E-04	0.00E+00	0.00E+00	7.06E-08	0.00E+00	3.04E-07	0.00E+00	0.00E+00	4.20E-06	2.52E-06	9.59E-03	
	Inhalation rate	IR	m3/hr																				
	Exposure time	ET	h/d																				
	Exposure frequency	EF	d/y																				
	Exposure duration	ED	y																				
	Body weight	BW	kg																				
	Averaging time carcinogens	AT <sub>c</sub>	d																				
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				
	Average intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	5.2369E-10	0	0	3.34903E-10	0	7.65492E-10	4.21538E-08	4.00849E-06	0	0	9.12901E-10	0	3.93091E-09	0	0	5.43086E-08	3.25851E-08	0.000124005	
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02		
	Risk	R	fraction		2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09				1.69E-09	0.00E+00	
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																				
	Average intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	5.55429E-09	0	0	3.552E-09	0	8.11886E-09	4.47086E-07	4.25143E-05	0	0	9.68229E-09	0	4.16914E-08	0	0	0.000000576	3.456E-07	0.0013152	
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d									8.57E-03										1.70E-02	
	Hazard Quotient	HQ	mg/kg-d									0.004960827											0.077364706
	Total Hazard Index	HI	mg/kg-d																				
Carcinogenic risk - all routes (detected organics)																							
Carcinogenic risk - all routes (undetected organics)																							
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>c</sub>	fraction	0.00E+00	2.09E-10	0.00E+00	0.00E+00	1.34E-10	0.00E+00	3.06E-10	1.69E-08	1.09E-07	0.00E+00	0.00E+00	2.81E-10	0.00E+00	4.56E-09	0.00E+00	0.00E+00	1.69E-09	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																							
Non-Carcinogenic risk - all routes (undetected organics)																							
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	0	0	0	0	0	0.004960827	0	0	0	0	0	0	0	0	0.077364706



TABLE 7-7  
CTE RISK CALCULATIONS FOR ON-SITE WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																	
Exposure Route	Parameter	Symbol	Units	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour Intrusion - Inhalation	POE concentration	C <sub>o-in</sub>	ug/m3	1.49E-04	1.23E-02	0.00E+00	5.62E-06	2.63E-03	8.52E-04	0.00E+00	5.09E-04	4.74E-03	7.64E-05	0.00E+00	0.00E+00	3.01E-02	2.21E-01	6.16E-03			
	POE concentration	C <sub>o-in</sub>	mg/m3	1.49E-07	1.23E-05	0.00E+00	5.62E-09	2.63E-06	8.52E-07	0.00E+00	5.09E-07	4.74E-06	7.64E-08	0.00E+00	0.00E+00	3.01E-05	2.21E-04	6.16E-06			
	Inhalation rate	IR	m3/hr																		
	Exposure time	ET	h/d																		
	Exposure frequency	EF	d/y																		
	Exposure duration	ED	y																		
	Body weight	BW	kg																		
	Averaging time carcinogens	AT <sub>c</sub>	d																		
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																		
	Average Intake from Inhalation carcinogens	I <sub>a</sub>	mg/kg-d	1.92666E-09	1.59047E-07	0	7.267E-11	3.40075E-08	1.10169E-08	0	6.58168E-09	6.12911E-08	9.87899E-10	0	0	3.89211E-07	2.85767E-06	7.96526E-08			
	Inhalation Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction		1.29E-08	0.00E+00		2.62E-09	1.77E-08	0.00E+00						8.17E-07	1.71E-08	2.39E-09	1.07E-06	100%	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
Average intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	2.04343E-08	1.68686E-06	0	7.70743E-10	3.60686E-07	1.16846E-07	0	6.98057E-08	6.50057E-07	1.04777E-08	0	0	0.000004128	3.03086E-05	8.448E-07				
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d													1.40E-01	1.14E-02	2.86E-02				
Hazard Quotient	HQ	mg/kg-d													2.94857E-05	0.002658647	2.95385E-05				
Total Hazard Index	HI	mg/kg-d																	8.97E-02	100%	
Carcinogenic risk - all routes (detected organics)																			1.04E-06		
Carcinogenic risk - all routes (undetected organics)																			2.68E-08		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		0.00E+00	1.29E-08	0.00E+00	0.00E+00	2.62E-09	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.17E-07	1.71E-08	2.39E-09	1.07E-06	
Non-Carcinogenic risk - all routes (detected organics)																			8.95E-02		
Non-Carcinogenic risk - all routes (undetected organics)																			1.84E-04		
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0	0	0	0	0	0	0	0	0	2.94857E-05	0.002658647	2.95385E-05	8.97E-02		



TABLE 7-8  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

Chemicals of Potential Concern																								
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol		
Groundwater	Groundwater	Excavation	Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				Water ingestion rate	IR	l/d	0.12																	
				Exposure frequency	EF	d/y	250																	
				Exposure duration	ED	y	1																	
				Body weight	BW	kg	70																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Average Intake from ingestion carcinogens	I <sub>a</sub>	mg/kg-d		7.33184E-11	6.47638E-10	9.67179E-09	2.51607E-08	3.35477E-08	1.13827E-09	6.08387E-10	5.73665E-08	4.14314E-08	1.52877E-10	4.65122E-09	2.10679E-10	2.80794E-09	2.35555E-10	1.51317E-10		
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		1.47E-11	3.69E-11				1.04E-10	4.14E-11		9.94E-10	1.68E-12	3.16E-09	1.41E-09		1.06E-10			
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																		
				Average Intake from ingestion non-carcinogens	I <sub>a</sub>	mg/kg-d		5.13229E-09	4.53346E-08	6.77025E-07	1.76125E-06	2.34834E-06	7.96791E-08	4.25871E-08	4.01566E-06	2.9002E-06	1.07014E-08	3.25585E-07	1.47476E-08	1.96556E-07	1.64888E-08	1.05922E-08		
				Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
				Hazard Quotient	HQ	mg/kg-d		8.55382E-08	1.13337E-05	6.77025E-06	0.000176125	0.000234834	3.98395E-06	3.87155E-05	0.000133855	9.66732E-05	0.000107014	0.000162793	1.47476E-05	3.93112E-05		0.000105922		
				Total Hazard Index	HI	mg/kg-d																		
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				event duration	t <sub>event</sub>	hr	12																	
				absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event		4.10047E-10	3.20469E-09	4.85462E-08	1.43777E-07	1.57314E-06	3.58512E-09	3.54061E-09	2.22447E-06	1.21588E-06	4.20667E-09	1.22407E-08	0	1.7053E-08	3.08616E-09	4.07498E-10		
				Event frequency	EF	events/day	1																	
				Exposure duration	ED	y	1																	
				Exposure frequency	EF	d/y	250																	
				Skin surface area	SA	cm2	3,300																	
				Body weight	BW	kg	70																	
				Averaging time	AT	d/y	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.89147E-10	1.47826E-09	2.23934E-08	6.63213E-08	7.25658E-07	1.65375E-09	1.63321E-09	1.0261E-06	5.60864E-07	1.94045E-09	5.64639E-09	0	7.8662E-09	1.42359E-09	1.87971E-10		
				Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		3.78E-11	8.43E-11				1.50E-10	1.11E-10		1.35E-08	2.13E-11	4.52E-09	0.00E+00		6.41E-10			
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																		
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		1.32403E-08	1.03478E-07	1.56754E-06	4.64249E-06	5.07961E-05	1.15762E-07	1.14325E-07	7.18273E-05	3.92604E-05	1.35832E-07	3.95247E-07	0	5.50634E-07	9.9651E-08	1.3158E-08		
				Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
Hazard Quotient	HQ	mg/kg-d		2.20671E-07	2.58696E-05	1.56754E-05	0.000464249	0.005079608	5.78811E-06	0.000103932	0.002394245	0.001308682	0.001358318	0.000197624	0	0.000110127		0.00013158						
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES					Sum Ri	fraction		5.25E-11	1.21E-10	0.00E+00	0.00E+00	0.00E+00	2.54E-10	1.52E-10	0.00E+00	1.45E-08	2.30E-11	7.68E-09	1.41E-09	0.00E+00	7.47E-10	0.00E+00		
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES					Sum HI	fraction		3.06209E-07	3.72032E-05	2.24456E-05	0.000640374	0.005314442	9.77206E-06	0.000142647	0.0025281	0.001405355	0.001465331	0.000360416	1.47476E-05	0.000149438	0	0.000237501		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-8  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																				
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	POE concentration	C <sub>w</sub>	mg/m3	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	Water ingestion rate	IR	l/d																					
	Exposure frequency	EF	d/y																					
	Exposure duration	ED	y																					
	Body weight	BW	kg																					
	Averaging time carcinogens	AT <sub>c</sub>	d																					
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																					
	Average intake from ingestion carcinogens	I <sub>a</sub>	mg/kg-d	1.65222E-12	9.58289E-13	1.15656E-12	6.60889E-13	4.29578E-13	7.26978E-13	2.974E-11	9.42689E-09	4.69231E-12	4.36187E-12	2.69019E-12	1.5499E-12	2.35505E-08	3.41482E-09	7.93067E-10	9.81269E-09	6.55186E-11	8.50433E-06	8.04641E-10	5.1026E-08	
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00	4.00E-02	2.00E-02	6.20E-02	1.30E-01	8.40E-02	8.40E-02	
	Risk	R	fraction	6.61E-13	3.83E-13	4.63E-13	2.64E-13	1.72E-13	2.91E-13	1.19E-11	5.18E-10	3.43E-12	3.18E-11	1.96E-12	1.13E-13	2.59E-08	1.11E-11	6.08E-10	8.52E-12					
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
Incidental ingestion of groundwater	Average intake from ingestion non-carcinogens	I <sub>a</sub>	mg/kg-d	1.15656E-10	6.70802E-11	8.09589E-11	4.62622E-11	3.00705E-11	5.08885E-11	2.0818E-09	6.59883E-07	3.28462E-10	3.05331E-10	1.88313E-10	1.08493E-10	1.64853E-06	2.39037E-07	5.55147E-08	6.86888E-07	4.5863E-09	0.000595303	5.63249E-08	3.57182E-06	
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02	
	Hazard Quotient	HQ	mg/kg-d	1.65222E-06					2.54442E-06		0.000164971						5.97593E-06	2.77573E-06	3.43444E-05	6.55186E-06	0.029765166	2.81624E-06	0.000357182	
	Total Hazard Index	HI	mg/kg-d																					
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	event duration	t <sub>event</sub>	hr																					
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	0	8.65051E-11	1.04403E-10	4.46448E-10	3.11296E-10	8.36258E-10	2.13652E-07	1.00564E-07	1.63214E-09	2.83061E-09	1.79014E-09	1.01597E-09	3.30985E-08	1.2647E-07	3.68309E-08	3.66002E-08	8.16161E-10	0.000168459	2.31554E-09	2.63463E-07	
	Event frequency	EV	events/day																					
	Exposure duration	ED	y																					
	Exposure frequency	EF	d/y																					
	Skin surface area	SA	cm2																					
	Body weight	BW	kg																					
	Averaging time	AT	d/y																					
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																					
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	0	3.99031E-11	4.81589E-11	2.05938E-10	1.43595E-10	3.85749E-10	9.85536E-08	4.63881E-08	7.52873E-10	1.3057E-09	8.25757E-10	4.68449E-10	1.52677E-08	5.83381E-08	1.69893E-08	1.68829E-08	3.76479E-10	7.77068E-05	1.06811E-09	1.2153E-07	
	Dermal Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00	4.00E-02	2.00E-02	6.20E-02	1.30E-01	8.40E-02	8.40E-02	
Risk	R	fraction	0.00E+00	1.60E-11	1.93E-11	8.24E-11	5.74E-11	1.54E-10	3.94E-08	2.55E-09	1.77E-10	3.07E-09	1.90E-11	3.42E-11	1.68E-08	2.38E-10	1.05E-09	4.89E-11						
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
Dermal contact with groundwater	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0	2.79322E-09	3.37113E-09	1.44156E-08	1.00516E-08	2.70024E-08	6.89875E-06	3.24716E-06	5.27011E-08	9.13993E-08	5.7803E-08	3.28054E-08	1.06874E-06	4.08367E-06	1.18925E-06	1.18181E-06	2.63535E-08	0.005439474	7.47679E-08	8.50713E-06	
	Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03	
	Hazard Quotient	HQ	mg/kg-d	0					0.001350122		0.000811791						0.000102092	0.000312962	5.90903E-05	3.76479E-05	0.877334519	3.7384E-06	0.004253567	
	Total Hazard Index	HI	mg/kg-d																					
Sum Rt				fraction	6.61E-13	1.63E-11	1.97E-11	8.26E-11	5.76E-11	1.55E-10	3.94E-08	3.07E-09	1.80E-10	3.10E-09	2.10E-11	3.43E-11	4.27E-08	0.00E+00	2.49E-10	1.66E-09	5.75E-11	0.00E+00	1.57E-10	0.00E+00
s) JTES				Sum HI	fraction	1.65222E-06	0	0	0	0	0.001352667	0.000976762	0	0	0	0	0	0.000108068	0.000315737	9.34347E-05	4.41997E-05	0.907099685	6.55464E-06	0.004610749



TABLE 7-8  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																
Exposure Route	Parameter	Symbol	Units	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution		
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	POE concentration	C <sub>w</sub>	mg/m3	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	Water ingestion rate	IR	l/d																	
	Exposure frequency	EF	d/y																	
	Exposure duration	ED	y																	
	Body weight	BW	kg																	
	Averaging time carcinogens	AT <sub>c</sub>	d																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.43919E-12	5.45233E-12	4.92362E-12	1.26609E-11	1.5499E-12	2.24602E-10	2.71434E-09	2.93274E-10	3.17931E-08	2.98722E-11	4.3612E-09	9.62818E-08	1.43265E-09				
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01				
Risk	R	fraction	1.05E-11		3.84E-13	2.03E-11	1.13E-12				2.23E-07	3.58E-12	2.36E-09	3.85E-08	1.03E-09		2.94E-07	61%		
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																		
Average Intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.00744E-10	3.81663E-10	3.44654E-10	8.86262E-10	1.08493E-10	1.57221E-08	1.90004E-07	2.05292E-08	2.22552E-06	2.09105E-09	3.05284E-07	6.73973E-06	1.00286E-07					
Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03					
Hazard Quotient	HQ	mg/kg-d		9.54159E-08	1.72327E-06	1.10783E-06		3.93053E-06	9.5002E-06	4.10583E-05		6.97018E-08	3.05284E-05	0.022465753	3.34286E-05		3.41E-05	3%		
Total Hazard Index	HI	mg/kg-d																		
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	event duration	t <sub>event</sub>	hr																	
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	1.732E-09	3.42608E-10	3.62066E-10	1.86906E-09	1.23553E-09	0	8.53355E-08	1.2109E-09	5.76652E-08	1.14039E-08	1.07791E-07	8.44062E-07	5.87356E-09				
	Event frequency	EV	events/day																	
	Exposure duration	ED	y																	
	Exposure frequency	EF	d/y																	
	Skin surface area	SA	cm2																	
	Body weight	BW	kg																	
	Averaging time	AT	d/y																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	7.98938E-10	1.58038E-10	1.67014E-10	8.62162E-10	5.69927E-10	0	3.93636E-08	5.58565E-10	2.65998E-08	5.2604E-09	4.97217E-08	3.89349E-07	2.70936E-09					
Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01					
Risk	R	fraction	5.83E-09		1.30E-11	1.38E-09	1.31E-10				4.79E-08	6.31E-10	2.68E-08	2.34E-08	1.95E-09		1.91E-07	39%		
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																		
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	5.59257E-08	1.10627E-08	1.1691E-08	6.03513E-08	3.98949E-08	0	2.75545E-06	3.90996E-08	1.86199E-06	3.68228E-07	3.48052E-06	2.72544E-05	1.89655E-07					
Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03					
Hazard Quotient	HQ	mg/kg-d		2.76567E-06	5.84549E-05	7.54391E-05		0	0.000137773	7.81991E-05		1.22743E-05	0.000348052	0.605654294	6.32184E-05					
Total Hazard Index	HI	mg/kg-d															1.50E+00	97%		
																	4.63E-07			
																	2.39E-08			
	Sum R <sub>c</sub>	fraction		5.84E-09	0.00E+00	1.34E-11	1.40E-09	1.32E-10	0.00E+00	0.00E+00	0.00E+00	2.70E-07	6.35E-10	2.92E-08	6.19E-08	2.98E-09	4.88E-07			
																	1.55E+00			
																	4.13E-03			
s) JTES	Sum HI	fraction		0	2.86109E-06	6.01782E-05	7.6547E-05	0	3.93053E-06	0.000147273	0.000119257	0	1.2344E-05	0.00037858	0.628120048	9.6647E-05	1.56E+00			



TABLE 7-9  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																	
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol		
Groundwater	Groundwater	Excavation	Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				Water ingestion rate	IR	l/d	0.12																	
				Exposure frequency	EF	d/y	250																	
				Exposure duration	ED	y	1																	
				Body weight	BW	kg	70																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		7.33184E-11	6.47638E-10	9.67179E-09	2.51607E-08	3.35477E-08	1.13827E-09	6.08387E-10	5.73665E-08	4.14314E-08	1.52877E-10	4.65122E-09	2.10679E-10	2.80794E-09	2.35555E-10	1.51317E-10		
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		1.47E-11	3.69E-11				1.04E-10	4.14E-11		9.94E-10	1.68E-12	3.16E-09	1.41E-09		1.06E-10			
				Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																		
				Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.13229E-09	4.53346E-08	6.77025E-07	1.76125E-06	2.34834E-06	7.96791E-08	4.25871E-08	4.01566E-06	2.9002E-06	1.07014E-08	3.25585E-07	1.47476E-08	1.96556E-07	1.64888E-08	1.05922E-08		
				Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
				Hazard Quotient	HQ	mg/kg-d		8.55382E-08	1.13337E-05	6.77025E-06	0.000176125	0.000234834	3.98395E-06	3.87155E-05	0.000133855	9.66732E-05	0.000107014	0.000162793	1.47476E-05	3.93112E-05		0.000105922		
				Total Hazard Index	HI	mg/kg-d																		
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				event duration	t <sub>event</sub>	hr	12																	
				absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event		4.10047E-10	3.20469E-09	4.85462E-08	1.43777E-07	1.57314E-06	3.58512E-09	3.54061E-09	2.22447E-06	1.21588E-06	4.20667E-09	1.22407E-08	0	1.7053E-08	3.08616E-09	4.07498E-10		
				Event frequency	EV	events/day	1																	
				Exposure duration	ED	y	1																	
				Exposure frequency	EF	d/y	250																	
				Skin surface area	SA	cm2	3,300																	
				Body weight	BW	kg	70																	
				Averaging time	AT	d/y	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.89147E-10	1.47826E-09	2.23934E-08	6.63213E-08	7.25658E-07	1.65375E-09	1.63321E-09	1.0261E-06	5.60864E-07	1.94045E-09	5.64639E-09	0	7.8662E-09	1.42359E-09	1.87971E-10		
				Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		3.78E-11	8.43E-11				1.50E-10	1.11E-10		1.35E-08	2.13E-11	4.52E-09	0.00E+00		6.41E-10			
				Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																		
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		1.32403E-08	1.03478E-07	1.56754E-06	4.64249E-06	5.07961E-05	1.15762E-07	1.14325E-07	7.18273E-05	3.92604E-05	1.35832E-07	3.95247E-07	0	5.50634E-07	9.9651E-08	1.3158E-08		
				Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
Hazard Quotient	HQ	mg/kg-d		2.20671E-07	2.58696E-05	1.56754E-05	0.000464249	0.005079608	5.78811E-06	0.000103932	0.002394245	0.001308682	0.001358318	0.000197624	0	0.000110127		0.00013158						
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES					Sum R <sub>c</sub>	fraction		5.25E-11	1.21E-10	0.00E+00	0.00E+00	0.00E+00	2.54E-10	1.52E-10	0.00E+00	1.45E-08	2.30E-11	7.68E-09	1.41E-09	0.00E+00	7.47E-10	0.00E+00		
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES					Sum HI	fraction		3.06209E-07	3.72032E-05	2.24456E-05	0.000640374	0.005314442	9.77206E-06	0.000142647	0.0025281	0.001405355	0.001465331	0.000360416	1.47476E-05	0.000149438	0	0.000237501		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-9  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																				
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Is (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	POE concentration	C <sub>w</sub>	mg/m3	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	Water ingestion rate	IR	l/d																					
	Exposure frequency	EF	d/y																					
	Exposure duration	ED	y																					
	Body weight	BW	kg																					
	Averaging time carcinogens	AT <sub>c</sub>	d																					
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																					
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.65222E-12	9.58289E-13	1.15656E-12	6.60889E-13	4.29578E-13	7.26978E-13	2.974E-11	9.42689E-09	4.69231E-12	4.36187E-12	2.69019E-12	1.5499E-12	2.35505E-08	3.41482E-09	7.93067E-10	9.81269E-09	6.55186E-11	8.50433E-06	8.04641E-10	5.1026E-08	
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02	
Risk	R <sub>i</sub>	fraction	6.61E-13	3.83E-13	4.63E-13	2.64E-13	1.72E-13	2.91E-13	1.19E-11	5.18E-10	3.43E-12	3.18E-11	1.96E-12	1.13E-13	2.59E-08		1.11E-11	6.08E-10	8.52E-12		6.76E-11			
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
Dermal contact with groundwater	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.15656E-10	6.70802E-11	8.09589E-11	4.62622E-11	3.00705E-11	5.08885E-11	2.0818E-09	6.59883E-07	3.28462E-10	3.05331E-10	1.88313E-10	1.08493E-10	1.64853E-06	2.39037E-07	5.55147E-08	6.86888E-07	4.5863E-09	0.000595303	5.63249E-08	3.57182E-06	
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02	
	Hazard Quotient	HQ	mg/kg-d	1.65222E-06					2.54442E-06		0.000164971						5.97593E-06	2.77573E-06	3.43444E-05	6.55186E-06	0.029765166	2.81624E-06	0.000357182	
	Total Hazard Index	HI	mg/kg-d																					
	POE concentration	C <sub>w</sub>	ug/l	0.0000985	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	event duration	tevent	hr																					
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	0	8.65051E-11	1.04403E-10	4.46448E-10	3.11296E-10	8.36258E-10	2.13652E-07	1.00564E-07	1.63214E-09	2.83061E-09	1.79014E-09	1.01597E-09	3.30985E-08	1.2647E-07	3.68309E-08	3.66002E-08	8.16161E-10	0.000168459	2.31554E-09	2.63463E-07	
	Event frequency	EV	events/day																					
	Exposure duration	ED	y																					
	Exposure frequency	EF	d/y																					
Skin surface area	SA	cm2																						
Body weight	BW	kg																						
Averaging time	AT	d/y																						
Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	0	3.99031E-11	4.81589E-11	2.05938E-10	1.43595E-10	3.85749E-10	9.85536E-08	4.63881E-08	7.52873E-10	1.3057E-09	8.25757E-10	4.68649E-10	1.52677E-08	5.83381E-08	1.69893E-08	1.68829E-08	3.76479E-10	7.77068E-05	1.06811E-09	1.2153E-07	
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		
	Risk	R <sub>d</sub>	fraction	0.00E+00	1.60E-11	1.93E-11	8.24E-11	5.74E-11	1.54E-10	3.94E-08	2.55E-09	1.77E-10	3.07E-09	1.90E-11	3.42E-11	1.68E-08		2.38E-10	1.05E-09	4.89E-11		8.97E-11		
	Total carcinogenic risk for exposure route	R <sub>d</sub>	fraction																					
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0	2.79322E-09	3.37113E-09	1.44156E-08	1.00516E-08	2.70024E-08	6.89875E-06	3.24716E-06	5.27011E-08	9.13993E-08	5.7803E-08	3.28054E-08	1.06874E-06	4.08367E-06	1.18925E-06	1.18181E-06	2.63535E-08	0.005439474	7.47679E-08	8.50713E-06	
	Dermal Reference Dose	RfD <sub>derm</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03	
	Hazard Quotient	HQ	mg/kg-d	0					0.001350122		0.000811791						0.000102092	0.000312962	5.90903E-05	3.76479E-05	0.877334519	3.7384E-06	0.004253567	
	Total Hazard Index	HI	mg/kg-d																					
Sum Ri				fraction	6.61E-13	1.63E-11	1.97E-11	8.26E-11	5.76E-11	1.55E-10	3.94E-08	3.07E-09	1.80E-10	3.10E-09	2.10E-11	3.43E-11	4.27E-08	0.00E+00	2.49E-10	1.66E-09	5.75E-11	0.00E+00	1.57E-10	0.00E+00
s) JTES				Sum HI	fraction	1.65222E-06	0	0	0	0	0.001352667	0	0.000976762	0	0	0	0	0.000108068	0.000315737	9.34347E-05	4.41997E-05	0.907099685	6.55464E-06	0.004610749



TABLE 7-9  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern													Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Dibenzo(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	POE concentration	C <sub>w</sub>	mg/m3	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	Water Ingestion rate	IR	l/d															
	Exposure frequency	EF	d/y															
	Exposure duration	ED	y															
	Body weight	BW	kg															
	Averaging time carcinogens	AT <sub>c</sub>	d															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.43919E-12	5.45233E-12	4.92362E-12	1.26609E-11	1.5499E-12	2.24602E-10	2.71434E-09	2.93274E-10	3.17931E-08	2.98722E-11	4.3612E-09	9.62818E-08	1.43265E-09		
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01		
	Risk	R	fraction	1.05E-11		3.84E-13	2.03E-11	1.13E-12				2.23E-07	3.58E-12	2.36E-09	1.93E-09	1.03E-09		
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction														1.24E-07	61%
Average Intake from Ingestion non-carcinogens	I <sub>o</sub>	mg/kg-d	1.00744E-10	3.81663E-10	3.44654E-10	8.86262E-10	1.08493E-10	1.57221E-08	1.90004E-07	2.05292E-08	2.22552E-06	2.09105E-09	3.05284E-07	6.73973E-06	1.00286E-07			
Ingestion Reference Dose	RD <sub>inh</sub>	mg/kg-d		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
Hazard Quotient	HQ	mg/kg-d		9.54159E-08	1.72327E-06	1.10783E-06		3.93053E-06	9.5002E-06	4.10583E-05		6.97018E-08	3.05284E-05	0.022465753	3.34286E-05			
Total Hazard Index	HI	mg/kg-d														1.56E-02	3%	
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	event duration	t <sub>event</sub>	hr															
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	1.732E-09	3.42608E-10	3.62066E-10	1.86906E-09	1.23553E-09	0	8.53355E-08	1.2109E-09	5.76652E-08	1.14039E-08	1.07791E-07	8.44062E-07	5.87356E-09		
	Event frequency	EV	events/day															
	Exposure duration	ED	y															
	Exposure frequency	EF	d/y															
	Skin surface area	SA	cm2															
	Body weight	BW	kg															
	Averaging time	AT	d/y															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	7.98938E-10	1.58038E-10	1.67014E-10	8.62162E-10	5.69927E-10	0	3.93636E-08	5.58565E-10	2.65998E-08	5.2604E-09	4.97217E-08	3.89349E-07	2.70936E-09		
	Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01		
Risk	R	fraction	5.83E-09		1.30E-11	1.38E-09	1.31E-10				4.79E-08	6.31E-10	2.68E-08	1.17E-09	1.95E-09			
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction														1.69E-07	39%	
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	5.59257E-08	1.10627E-08	1.1691E-08	6.03513E-08	3.98949E-08	0	2.75545E-06	3.90996E-08	1.86199E-06	3.68228E-07	3.48052E-06	2.72544E-05	1.89655E-07			
Dermal Reference Dose	RD <sub>inh</sub>	mg/kg-d		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
Hazard Quotient	HQ	mg/kg-d		2.76567E-06	5.84549E-05	7.54391E-05		0	0.000137773	7.81991E-05		1.22743E-05	0.000348052	0.605654294	6.32184E-05			
Total Hazard Index	HI	mg/kg-d														1.50E+00	97%	
Sum Rt				fraction	5.84E-09	0.00E+00	1.34E-11	1.40E-09	1.32E-10	0.00E+00	0.00E+00	0.00E+00	2.70E-07	6.35E-10	2.92E-08	3.09E-09	2.98E-09	4.04E-07
																	2.39E-08	
																	1.55E+00	
																	4.13E-03	
s) JTES				fraction	0	2.86109E-06	6.01782E-05	7.6547E-05	0	3.93053E-06	0.000147273	0.000119257	0	1.2344E-05	0.00037858	0.628120048	9.6647E-05	1.56E+00



TABLE 7-10  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
Missouri Electric Works, Cape Girardeau

								Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Acrolein-1016			
Groundwater	Groundwater	Excavation	Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021	0.0000985			
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021	0.0000985			
				Water ingestion rate	IR	l/d	0.12																			
				Exposure frequency	EF	d/y	250																			
				Exposure duration	ED	y	1																			
				Body weight	BW	kg	70																			
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																			
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																			
				Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		7.33184E-11	6.47638E-10	9.67179E-09	2.51607E-08	3.35477E-08	1.13827E-09	6.08387E-10	5.73665E-08	4.14314E-08	1.52877E-10	4.65122E-09	2.10679E-10	2.80794E-09	2.35555E-10	1.51317E-10	1.65222E-12			
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01			
				Risk	R	fraction		1.47E-11	3.69E-11				1.04E-10	4.14E-11		9.94E-10	1.68E-12	3.16E-09	1.41E-09		1.06E-10		6.61E-13			
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																				
				Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.13229E-09	4.53346E-08	6.77025E-07	1.76125E-06	2.34834E-06	7.96791E-08	4.25871E-08	4.01566E-06	2.9002E-06	1.07014E-08	3.25585E-07	1.47476E-08	1.96556E-07	1.64888E-08	1.05922E-08	1.15656E-10			
				Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05			
				Hazard Quotient	HQ	mg/kg-d		8.55382E-08	1.13337E-05	6.77025E-06	0.000176125	0.000234834	3.98395E-06	3.87155E-05	0.000133855	9.66732E-05	0.000107014	0.000162793	1.47476E-05	3.93112E-05		0.000105922	1.65222E-06			
				Total Hazard Index	HI	mg/kg-d																				
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021	0.0000985			
				event duration	t <sub>event</sub>	hr	12																			
				absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event		4.10047E-10	3.20449E-09	4.85462E-08	1.43777E-07	1.57314E-06	3.58512E-09	3.54061E-09	2.22447E-06	1.21588E-06	4.20667E-09	1.22407E-08	0	1.7053E-08	3.08616E-09	4.07498E-10	0			
				Event frequency	EV	events/day	1																			
				Exposure duration	ED	y	1																			
				Exposure frequency	EF	d/y	250																			
				Skin surface area	SA	cm2	3,300																			
				Body weight	BW	kg	70																			
				Averaging time	AT	d/y	25,550																			
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																			
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.89147E-10	1.47826E-09	2.23934E-08	6.63213E-08	7.25658E-07	1.65375E-09	1.63321E-09	1.0261E-06	5.60864E-07	1.94045E-09	5.64639E-09	0	7.8662E-09	1.42359E-09	1.87971E-10	0			
				Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01			
				Risk	R	fraction		3.78E-11	8.43E-11				1.50E-10	1.11E-10		1.35E-08	2.13E-11	4.52E-09	0.00E+00		6.41E-10		0.00E+00			
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																				
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		1.32403E-08	1.03478E-07	1.56754E-06	4.64249E-06	5.07961E-05	1.15762E-07	1.14325E-07	7.18273E-05	3.92604E-05	1.35832E-07	3.95247E-07	0	5.50634E-07	9.9651E-08	1.3158E-08	0			
				Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05			
Hazard Quotient	HQ	mg/kg-d		2.20671E-07	2.58696E-05	1.56754E-05	0.000464249	0.005079608	5.78811E-06	0.000103932	0.002394245	0.001308682	0.001358318	0.000197624	0	0.000110127		0.00013158	0							
Total Hazard Index	HI	mg/kg-d																								
Carcinogenic risk - all routes (detected organics)																										
Carcinogenic risk - all routes (undetected organics)																										
TOTAL CARCINOGENIC RISK - ALL ROUTES								Sum Ri	fraction		5.25E-11	1.21E-10	0.00E+00	0.00E+00	0.00E+00	2.54E-10	1.52E-10	0.00E+00	1.45E-08	2.30E-11	7.68E-09	1.41E-09	0.00E+00	7.47E-10	0.00E+00	6.61E-13
Non-Carcinogenic risk - all routes (detected organics)																										
Non-Carcinogenic risk - all routes (undetected organics)																										
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES								Sum HI	fraction		3.06209E-07	3.72032E-05	2.24456E-05	0.000640374	0.005314442	9.77206E-06	0.000142647	0.0025281	0.001405355	0.001465331	0.000360416	1.47476E-05	0.000149438	0	0.000237501	1.65222E-06

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-10  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloropropyl) Ether	Bi(2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenzo(a,h)Anthracene	Dibenzofuran	
Incidental ingestion of groundwater	POE concentration	C <sub>gw</sub>	ug/l	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	POE concentration	C <sub>gw</sub>	mg/m3	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	Water ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	9.58289E-13	1.15656E-12	6.60889E-13	4.29578E-13	7.26978E-13	2.974E-11	9.42689E-09	4.69231E-12	4.36187E-12	2.69019E-12	1.5499E-12	2.35505E-08	3.41482E-09	7.93067E-10	9.81269E-09	6.55186E-11	8.50433E-06	8.04641E-10	5.1026E-08	1.43919E-12	5.45233E-12	
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00	
	Risk	R	fraction	3.83E-13	4.63E-13	2.64E-13	1.72E-13	2.91E-13	1.19E-11	5.18E-10	3.43E-12	3.18E-11	1.96E-12	1.13E-13	2.59E-08		1.11E-11	6.08E-10	8.52E-12		6.76E-11		1.05E-11		
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
Dermal contact with groundwater	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	6.70802E-11	8.09589E-11	4.62622E-11	3.00705E-11	5.0888E-11	2.0818E-09	6.59883E-07	3.28462E-10	3.05331E-10	1.88313E-10	1.08493E-10	1.64853E-06	2.39037E-07	5.55147E-08	6.86888E-07	4.5843E-09	0.000595303	5.63249E-08	3.57182E-06	1.00744E-10	3.81663E-10	
	Ingestion Reference Dose	RfD <sub>gw</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	
	Hazard Quotient	HQ	mg/kg-d					2.54442E-06		0.000164971						5.97593E-06	2.77573E-06	3.43444E-05	6.55186E-06	0.029765166	2.81624E-06	0.000357182		9.54159E-08	
	Total Hazard Index	HI	mg/kg-d																						
Dermal contact with groundwater	POE concentration	C <sub>gw</sub>	ug/l	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	event duration	tevent	hr																						
	absorbed dose per event	Daevent	mg/cm2-event	8.65051E-11	1.04403E-10	4.46448E-10	3.11296E-10	8.36258E-10	2.13652E-07	1.00564E-07	1.63214E-09	2.83061E-09	1.79014E-09	1.01597E-09	3.30985E-08	1.2647E-07	3.68309E-08	3.66002E-08	8.16161E-10	0.000168459	2.31554E-09	2.63463E-07	1.732E-09	3.42608E-10	
	Event frequency	EV	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.99031E-11	4.81589E-11	2.05938E-10	1.43595E-10	3.85749E-10	9.85536E-08	4.63881E-08	7.52873E-10	1.3057E-09	8.25757E-10	4.68649E-10	1.52677E-08	5.83381E-08	1.69893E-08	1.68829E-08	3.76479E-10	7.77068E-05	1.06811E-09	1.2153E-07	7.98938E-10	1.58038E-10	
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00	
Risk	R	fraction	1.60E-11	1.93E-11	8.24E-11	5.74E-11	1.54E-10	3.94E-08	2.55E-09	1.77E-10	3.07E-09	1.90E-11	3.42E-11	1.68E-08		2.38E-10	1.05E-09	4.89E-11		8.97E-11		5.83E-09			
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Dermal contact with groundwater	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	2.79322E-09	3.37113E-09	1.44156E-08	1.00516E-08	2.70024E-08	6.89875E-06	3.24716E-06	5.27011E-08	9.13993E-08	5.7803E-08	3.28054E-08	1.06874E-06	4.08367E-06	1.18925E-06	1.18181E-06	2.63535E-08	0.005439474	7.47679E-08	8.50713E-06	5.59257E-08	1.10627E-08	
	Dermal Reference Dose	RfD <sub>dw</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	
	Hazard Quotient	HQ	mg/kg-d					0.001350122		0.000811791						0.000102092	0.000312962	5.90903E-05	3.76479E-05	0.877334519	3.7384E-06	0.004253567		2.76567E-06	
	Total Hazard Index	HI	mg/kg-d																						
Sum Rt				fraction	1.63E-11	1.97E-11	8.26E-11	5.76E-11	1.55E-10	3.94E-08	3.07E-09	1.80E-10	3.10E-09	2.10E-11	3.43E-11	4.27E-08	0.00E+00	2.49E-10	1.66E-09	5.75E-11	0.00E+00	1.57E-10	0.00E+00	5.84E-09	0.00E+00
s) Sum HI				fraction	0	0	0	0	0.001352667	0	0.000976762	0	0	0	0	0	0.000108068	0.000315737	9.34347E-05	4.41997E-05	0.907099685	6.55464E-06	0.004610749	0	2.86109E-06



TABLE 7-10  
RME RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
Missouri Becthc Works, Cape Girardeau

				Chemicals of Potential Concern												Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Hexachloro-1,3-butadiene	Hexachlorobenzene	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541			
	POE concentration	C <sub>w</sub>	mg/m3	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541			
	Water ingestion rate	IR	l/d														
	Exposure frequency	EF	d/y														
	Exposure duration	ED	y														
	Body weight	BW	kg														
	Averaging time carcinogens	AT <sub>c</sub>	d														
	Averaging time non-carcinogens	AT <sub>nc</sub>	d														
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.92362E-12	1.26609E-11	1.5499E-12	2.24602E-10	2.71434E-09	2.93274E-10	3.17931E-08	2.98722E-11	4.3612E-09	9.62818E-08	1.43265E-09			
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R <sub>i</sub>	fraction	3.84E-13	2.03E-11	1.13E-12				2.23E-07	3.58E-12	2.34E-09	5.78E-10	1.03E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												2.60E-07		61%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.44654E-10	8.86262E-10	1.08493E-10	1.57221E-08	1.90004E-07	2.05292E-08	2.22552E-06	2.09105E-09	3.05284E-07	6.73973E-06	1.00284E-07			
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	2.00E-04								3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	1.72327E-06	1.10783E-06		3.93053E-06	9.5002E-06	4.10583E-05		6.97018E-08	3.05284E-05	0.022465753	3.34284E-05			
	Total Hazard Index	HI	mg/kg-d												5.41E-06		3%
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00029353	0.0007548	0.0000924	0.01339	0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541			
	event duration	t <sub>event</sub>	hr														
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	3.62066E-10	1.86906E-09	1.23553E-09	0	8.53355E-08	1.2109E-09	5.76652E-08	1.14039E-08	1.07791E-07	8.44062E-07	5.87356E-09			
	Event frequency	EV	events/day														
	Exposure duration	ED	y														
	Exposure frequency	EF	d/y														
	Skin surface area	SA	cm2														
	Body weight	BW	kg														
	Averaging time	AT	d/y														
	Averaging time non-carcinogens	AT <sub>nc</sub>	d														
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.67014E-10	8.62162E-10	5.69927E-10	0	3.93636E-08	5.58565E-10	2.65998E-08	5.2604E-09	4.97217E-08	3.89349E-07	2.70936E-09			
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01			
	Risk	R <sub>d</sub>	fraction	1.30E-11	1.38E-09	1.31E-10				4.79E-08	6.31E-10	2.68E-08	3.50E-10	1.95E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												1.48E-07		39%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.1691E-08	6.03513E-08	3.98949E-08	0	2.75545E-06	3.90996E-08	1.86199E-06	3.68228E-07	3.48052E-06	2.72544E-05	1.89655E-07			
	Dermal Reference Dose	RfD <sub>dh</sub>	mg/kg-d	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d	5.84549E-05	7.54391E-05		0	0.000137773	7.81991E-05		1.22743E-05	0.000348052	0.605654294	6.32184E-05			
	Total Hazard Index	HI	mg/kg-d												1.80E+00		97%
Sum R <sub>i</sub>				fraction	1.34E-11	1.40E-09	1.32E-10	0.00E+00	0.00E+00	0.00E+00	2.70E-07	6.35E-10	2.92E-08	9.28E-10	2.98E-09	4.27E-07	
s)															1.55E+00		
YES				Sum HI	fraction	6.01782E-05	7.6547E-05	0	3.93053E-06	0.000147273	0.000119257	0	1.2344E-05	0.00037858	0.628120048	9.6647E-05	1.84E+00



TABLE 7-11  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

								Chemicals of Potential Concern																
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol		
Groundwater	Groundwater	Excavation	Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				Water Ingestion rate	IR	l/d	0.04																	
				Exposure frequency	EF	d/y	219																	
				Exposure duration	ED	y	1																	
				Body weight	BW	kg	70																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.1409E-11	1.8911E-10	2.82416E-09	7.34694E-09	9.79592E-09	3.32376E-10	1.77649E-10	1.6751E-08	1.2098E-08	4.464E-11	1.35816E-09	6.15184E-11	8.19918E-10	6.8782E-11	4.41845E-11		
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		4.28E-12	1.08E-11				3.02E-11	1.21E-11		2.90E-10	4.91E-13	9.24E-10	4.12E-10		3.10E-11			
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.49863E-09	1.32377E-08	1.97691E-07	5.14286E-07	6.85714E-07	2.32663E-08	1.24354E-08	1.17257E-06	8.46857E-07	3.1248E-09	9.50709E-08	4.30629E-09	5.73943E-08	4.81474E-09	3.09291E-09		
				Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
				Hazard Quotient	HQ	mg/kg-d		2.49771E-08	3.30943E-06	1.97691E-06	5.14286E-05	6.85714E-05	1.16331E-06	1.13049E-05	3.90857E-05	2.82286E-05	0.000031248	4.75354E-05	4.30629E-06	1.14789E-05		3.09291E-05		
				Total Hazard Index	HI	mg/kg-d																		
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				event duration	t <sub>event</sub>	hr	4																	
				absorbed dose per event	D <sub>asvent</sub>	mg/cm2-event		1.75629E-10	1.27153E-09	1.8216E-08	5.38343E-08	7.8367E-07	1.34258E-09	1.35765E-09	9.77486E-07	5.22286E-07	2.08078E-09	5.3639E-09	0	6.71769E-09	1.66318E-09	1.88164E-10		
				Event frequency	EV	events/day	1																	
				Exposure duration	ED	y	1																	
				Exposure frequency	EF	d/y	219																	
				Skin surface area	SA	cm2	3,300																	
				Body weight	BW	kg	70																	
				Averaging time	AT	d/y	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		7.09685E-11	5.138E-10	7.36074E-09	2.17535E-08	3.16667E-07	5.42512E-10	5.486E-10	3.94984E-07	2.11046E-07	8.40806E-10	2.16745E-09	0	2.7145E-09	6.7206E-10	7.60336E-11		
				Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		1.42E-11	2.93E-11				4.94E-11	3.73E-11		5.07E-09	9.25E-12	1.73E-09	0.00E+00		3.02E-10			
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		4.96779E-09	3.5966E-08	5.15252E-07	1.52274E-06	2.21667E-05	3.79758E-08	3.8402E-08	2.76489E-05	1.47732E-05	5.88564E-08	1.51722E-07	0	1.90015E-07	4.70442E-08	5.32235E-09		
				Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		
Hazard Quotient	HQ	mg/kg-d		8.27966E-08	8.9915E-06	5.15252E-06	0.000152274	0.002216668	1.89879E-06	3.49109E-05	0.00092163	0.000492441	0.000588564	7.58608E-05	0	3.8003E-05		5.32235E-05						
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES								Sum Rt	fraction	1.85E-11	4.01E-11	0.00E+00	0.00E+00	0.00E+00	7.96E-11	4.94E-11	0.00E+00	5.36E-09	9.74E-12	2.66E-09	0.00E+00	3.33E-10	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES								Sum HI	fraction	1.07774E-07	1.23009E-05	7.12943E-06	0.000203703	0.002285239	3.06211E-06	4.62159E-05	0.000960715	0.00052067	0.000619812	0.000123396	4.94818E-05	0	8.41527E-05	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-11  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																			
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	bis(2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042
	POE concentration	C <sub>w</sub>	mg/m3		0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042
	Water ingestion rate	IR	l/d																				
	Exposure frequency	EF	d/y																				
	Exposure duration	ED	y																				
	Body weight	BW	kg																				
	Averaging time carcinogens	AT <sub>c</sub>	d																				
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				
	Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d		2.7982E-13	3.37714E-13	1.9298E-13	1.25437E-13	2.12278E-13	8.68408E-12	2.75265E-09	1.37016E-12	1.27367E-12	7.85535E-13	4.52571E-13	6.87673E-09	9.97127E-10	2.31576E-10	2.86531E-09	1.91314E-11	2.48327E-06	2.34955E-10	1.48996E-08
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02	
	Risk	R	fraction		1.12E-13	1.35E-13	7.72E-14	5.02E-14	8.49E-14	3.47E-12	1.51E-10	1.00E-12	9.30E-12	5.73E-13	3.30E-14	7.56E-09		3.24E-12	1.78E-10	2.49E-12		1.97E-11	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																				
	Average intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		1.95874E-11	2.364E-11	1.35086E-11	8.78057E-12	1.48594E-11	6.07886E-10	1.92686E-07	9.59109E-11	8.91566E-11	5.49874E-11	3.168E-11	4.81371E-07	6.97989E-08	1.62103E-08	2.00571E-07	1.3392E-09	0.000173829	1.64469E-08	1.04297E-06
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03					4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	2.00E-02	1.00E-02
	Hazard Quotient	HQ	mg/kg-d						7.42971E-07		4.81714E-05					1.74497E-06	8.10514E-07	1.00286E-05	1.91314E-06	0.008691429	8.22343E-07	0.000104297	
	Total Hazard Index	HI	mg/kg-d																				
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042
	event duration	t <sub>event</sub>	hr																				
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	4.88352E-11	5.8939E-11	2.57757E-10	1.79727E-10	4.82814E-10	1.23352E-07	3.69367E-08	1.03553E-09	1.65035E-09	1.03288E-09	5.86572E-10	1.32975E-08	5.92563E-08	2.12643E-08	1.54561E-08	3.43123E-10	6.58374E-05	1.10106E-09	1.01994E-07	
	Event frequency	EV	events/day																				
	Exposure duration	ED	y																				
	Exposure frequency	EF	d/y																				
	Skin surface area	SA	cm2																				
	Body weight	BW	kg																				
	Averaging time	AT	d/y																				
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	4.00E-01	1.97334E-11	2.38162E-11	1.04155E-10	7.26243E-11	1.95096E-10	4.98444E-08	1.49255E-08	4.18437E-10	6.66875E-10	4.17367E-10	2.37023E-10	5.37329E-09	2.39444E-08	8.59251E-09	6.24553E-09	1.3865E-10	2.66037E-05	4.44919E-10	4.12139E-08
	Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02	
Risk	R	fraction		7.89E-12	9.53E-12	4.17E-11	2.90E-11	7.80E-11	1.99E-08	8.21E-10	9.83E-11	1.57E-09	9.60E-12	1.73E-11	5.91E-09		1.20E-10	3.87E-10	1.80E-11		3.74E-11		
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	7.00E-05	1.38134E-09	1.66713E-09	7.29083E-09	5.0837E-09	1.36567E-08	3.48911E-06	1.04478E-06	2.92906E-08	4.66812E-08	2.92157E-08	1.65916E-08	3.7613E-07	1.67611E-06	6.01476E-07	4.37187E-07	9.70549E-09	0.001862259	3.11443E-08	2.88497E-06
	Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d						2.00E-05		4.00E-03					4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03	
	Hazard Quotient	HQ	mg/kg-d						0.000682836		0.000261195					4.19027E-05	0.000158283	2.18594E-05	1.3865E-05	0.300364356	1.55722E-06	0.001442485	
	Total Hazard Index	HI	mg/kg-d																				
Sum Rt				fraction	8.01E-12	9.66E-12	4.17E-11	2.91E-11	7.81E-11	1.99E-08	9.72E-10	9.93E-11	1.58E-09	1.02E-11	1.73E-11	1.35E-08	0.00E+00	1.24E-10	5.65E-10	2.05E-11	0.00E+00	5.71E-11	0.00E+00
Sum HI				fraction	0	0	0	0	0.000683579	0	0.000309367	0	0	0	0	0	4.36476E-05	0.000159094	3.18879E-05	1.57781E-05	0.309055784	2.37956E-06	0.001546782



TABLE 7-11  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (HIGH TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

Chemicals of Potential Concern																		
Exposure Route	Parameter	Symbol	Units	Dibenzo(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	
Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	POE concentration	C <sub>w</sub>	mg/m3	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	Water Ingestion rate	IR	l/d															
	Exposure frequency	EF	d/y															
	Exposure duration	ED	y															
	Body weight	BW	kg															
	Averaging time carcinogens	AT <sub>c</sub>	d															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.20245E-13	1.59208E-12	1.4377E-12	3.69698E-12	4.52571E-13		7.92588E-10	8.56359E-11	9.28359E-09	8.72268E-12	1.27347E-09	2.81143E-08	4.18335E-10		
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01		
	Risk	R	fraction	3.07E-12		1.12E-13	5.92E-12	3.30E-13				6.50E-08	1.05E-12	6.88E-10	1.12E-08	3.01E-10		
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction															8.49E-08
Incidental Ingestion of groundwater	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	2.94171E-11	1.11446E-10	1.00639E-10	2.58789E-10	3.168E-11		5.54811E-08	5.99451E-09	6.49851E-07	6.10587E-10	8.91429E-08	0.000001968	2.92834E-08		
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	4.00E-03	2.00E-04	8.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	2.78614E-08	5.03194E-07	3.23486E-07				2.77406E-06	1.1989E-05		2.03529E-08	8.91429E-06	0.00656	9.76114E-06		
	Total Hazard Index	HI	mg/kg-d															1.59E-02
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541		
	event duration	t <sub>event</sub>	hr															
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	8.45671E-10	1.71575E-10	2.07871E-10	1.03006E-09	6.20134E-10		3.51617E-08	4.70403E-10	2.26317E-08	6.30557E-09	4.8138E-08	3.35764E-07	2.11254E-09		
	Event frequency	EV	events/day															
	Exposure duration	ED	y															
	Exposure frequency	EF	d/y															
	Skin surface area	SA	cm2															
	Body weight	BW	kg															
	Averaging time	AT	d/y															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.4172E-10	6.93303E-11	8.39967E-11	4.16228E-10	2.50585E-10		1.42082E-08	1.90081E-10	9.14505E-09	2.54797E-09	1.94517E-08	1.35676E-07	8.53641E-10		
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01		
Risk	R	fraction	2.49E-09		6.55E-12	6.66E-10	5.76E-11				1.65E-08	3.06E-10	1.05E-08	8.14E-09	6.15E-10			
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction															7.56E-08	
Dermal contact with groundwater	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	2.39204E-08	4.85312E-09	5.87977E-09	2.91359E-08	1.75409E-08		9.94575E-07	1.33057E-08	6.40154E-07	1.78358E-07	1.36162E-06	9.49732E-06	5.97548E-08		
	Dermal Reference Dose	RfD <sub>dh</sub>	mg/kg-d	4.00E-03	2.00E-04	8.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	1.21328E-06	2.93989E-05	3.64199E-05				4.97287E-05	2.66113E-05		5.94525E-06	0.000136162	0.211051526	1.99183E-05		
	Total Hazard Index	HI	mg/kg-d															5.19E-01
Sum R <sub>t</sub>				fraction	2.50E-09	0.00E+00	6.66E-12	6.72E-10	5.80E-11	0.00E+00	0.00E+00	8.14E-08	3.07E-10	1.12E-08	1.94E-08	9.16E-10	1.62E-07	
																	5.33E-01	
																	1.78E-03	
Sum HI				fraction	0	1.24114E-06	2.99021E-05	3.67434E-05	0	5.25028E-05	3.86004E-05	0	5.96561E-06	0.000145076	0.217611526	2.96794E-05	6.35E-01	



TABLE 7-12  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

								Chemicals of Potential Concern																
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol		
Groundwater	Groundwater	Excavation	Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				Water ingestion rate	IR	l/d	0.04																	
				Exposure frequency	EF	d/y	219																	
				Exposure duration	ED	y	1																	
				Body weight	BW	kg	70																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																	
				Average Intake from Ingestion carcinogens	I <sub>o</sub>	mg/kg-d		2.1409E-11	1.8911E-10	2.82416E-09	7.34694E-09	9.79592E-09	3.32376E-10	1.77649E-10	1.6751E-08	1.2078E-08	4.464E-11	1.35816E-09	6.15184E-11	8.19918E-10	6.8782E-11	4.41845E-11		
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01			
				Risk	R	fraction		4.28E-12	1.08E-11				3.02E-11	1.21E-11		2.90E-10	4.91E-13	9.24E-10	4.12E-10		3.10E-11			
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
			Average Intake from Ingestion non-carcinogens	I <sub>o</sub>	mg/kg-d		1.49863E-09	1.32377E-08	1.97691E-07	5.14284E-07	6.85714E-07	2.32463E-08	1.24354E-08	1.17257E-06	8.46857E-07	3.1248E-09	9.50709E-08	4.30629E-09	5.73943E-08	4.81474E-09	3.09291E-09			
			Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04			
			Hazard Quotient	HQ	mg/kg-d		2.49771E-08	3.30943E-06	1.97691E-06	5.14284E-05	6.85714E-05	1.16331E-06	1.13049E-05	3.90857E-05	2.82286E-05	0.000031248	4.75354E-05	4.30629E-06	1.14789E-05		3.09291E-05			
			Total Hazard Index	HI	mg/kg-d																			
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021		
				event duration	t <sub>event</sub>	hr	4																	
				absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event		1.75629E-10	1.27153E-09	1.8216E-08	5.38343E-08	7.8367E-07	1.34258E-09	1.35765E-09	9.77486E-07	5.22286E-07	2.08078E-09	5.3639E-09	0	6.71769E-09	1.66318E-09	1.88164E-10		
				Event frequency	EV	events/day	1																	
				Exposure duration	ED	y	1																	
				Exposure frequency	EF	d/y	219																	
				Skin surface area	SA	cm2	3,300																	
				Body weight	BW	kg	70																	
Averaging time	AT	d/y		25,550																				
Averaging time non-carcinogens	AT <sub>nc</sub>	d		365																				
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			7.09685E-11	5.138E-10	7.36074E-09	2.17535E-08	3.16667E-07	5.42512E-10	5.484E-10	3.94984E-07	2.11046E-07	8.40806E-10	2.16745E-09	0	2.7145E-09	6.7206E-10	7.60336E-11					
Dermal Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01						
Risk	R	fraction		1.42E-11	2.93E-11				4.94E-11	3.73E-11		5.07E-09	9.25E-12	1.73E-09	0.00E+00		3.02E-10							
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		4.96779E-09	3.5966E-08	5.15252E-07	1.52274E-06	2.21667E-05	3.79758E-08	3.8402E-08	2.76489E-05	1.47732E-05	5.88564E-08	1.51722E-07	0	1.90015E-07	4.70442E-08	5.32235E-09						
Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04						
Hazard Quotient	HQ	mg/kg-d		8.27966E-08	8.9915E-06	5.15252E-06	0.000152274	0.002285239	1.89879E-06	3.49109E-05	0.00092163	0.000492441	0.000588564	7.58608E-05	0	3.8003E-05		5.32235E-05						
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES								Sum Rt	fraction	1.85E-11	4.01E-11	0.00E+00	0.00E+00	0.00E+00	7.96E-11	4.94E-11	0.00E+00	5.36E-09	9.74E-12	2.66E-09	0.00E+00	3.33E-10	0.00E+00	
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES								Sum HI	fraction	1.07774E-07	1.23009E-05	7.12943E-06	0.000203703	0.002285239	3.06211E-06	4.62159E-05	0.000960715	0.00052067	0.000619812	0.000123396	4.94818E-05	0	8.41527E-05	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-12  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																			
Exposure Route	Parameter	Symbol	Units	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bit(2-Chloroethyl) Ether	bit(2-Chloroisopropyl) Ether	bis (2-ethylhexyl) phthalate	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00005713	0.00006895	0.00003994	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	POE concentration	C <sub>w</sub>	mg/m3	0.00005713	0.00006895	0.00003994	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	Water ingestion rate	IR	l/d																				
	Exposure frequency	EF	d/y																				
	Exposure duration	ED	y																				
	Body weight	BW	kg																				
	Averaging time carcinogens	AT <sub>c</sub>	d																				
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.7982E-13	3.37714E-13	1.9298E-13	1.25437E-13	2.12278E-13	8.68408E-12	2.75265E-09	1.37016E-12	1.27367E-12	7.85535E-13	4.52571E-13	6.87673E-09	9.97127E-10	2.31576E-10	2.86531E-09	1.91314E-11	2.48327E-06	2.34955E-10	1.48996E-08
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02	
Risk	R	fraction		1.12E-13	1.35E-13	7.72E-14	5.02E-14	8.49E-14	3.47E-12	1.51E-10	1.00E-12	9.30E-12	5.73E-13	3.30E-14	7.56E-09		3.24E-12	1.78E-10	2.49E-12		1.97E-11		
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																					
Incidental ingestion of groundwater	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.95874E-11	2.364E-11	1.35086E-11	8.78057E-12	1.48594E-11	6.07886E-10	1.92686E-07	9.59109E-11	8.91566E-11	5.49874E-11	3.168E-11	4.81371E-07	6.97989E-08	1.62103E-08	2.00571E-07	1.3392E-09	0.000173829	1.64469E-08	1.04297E-06
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02
	Hazard Quotient	HQ	mg/kg-d						7.42971E-07		4.81714E-05						1.74497E-06	8.1C514E-07	1.00286E-05	1.91314E-06	0.008691429	8.22343E-07	0.000104297
	Total Hazard Index	HI	mg/kg-d																				
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00005713	0.00006895	0.00003994	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	
	event duration	t <sub>event</sub>	hr																				
	absorbed dose per event	D <sub>abs</sub>	mg/cm2-event	4.88352E-11	5.8939E-11	2.57757E-10	1.79727E-10	4.82814E-10	1.23352E-07	3.69367E-08	1.03553E-09	1.65035E-09	1.03288E-09	5.86572E-10	1.32975E-08	5.92563E-08	2.12643E-08	1.54561E-08	3.43123E-10	6.58374E-05	1.10106E-09	1.01994E-07	
	Event frequency	EF	events/day																				
	Exposure duration	ED	y																				
	Exposure frequency	EF	d/y																				
	Skin surface area	SA	cm2																				
	Body weight	BW	kg																				
	Averaging time	AT	d/y																				
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				
Dermal contact with groundwater	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.97334E-11	2.38162E-11	1.04155E-10	7.26243E-11	1.95096E-10	4.98444E-08	1.49255E-08	4.18437E-10	6.46875E-10	4.17367E-10	2.37023E-10	5.37329E-09	2.39444E-08	8.59251E-09	6.24553E-09	1.3865E-10	2.66037E-05	4.44919E-10	4.12139E-08
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02	
	Risk	R	fraction		7.89E-12	9.53E-12	4.17E-11	2.90E-11	7.80E-11	1.99E-08	8.21E-10	9.83E-11	1.57E-09	9.40E-12	1.73E-11	5.91E-09		1.20E-10	3.87E-10	1.80E-11		3.74E-11	
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																				
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		1.38134E-09	1.66713E-09	7.29083E-09	5.0837E-09	1.36567E-08	3.48911E-06	1.04478E-06	2.92906E-08	4.66812E-08	2.92157E-08	1.65916E-08	3.7613E-07	1.67611E-06	6.01476E-07	4.37187E-07	9.70549E-09	0.001862259	3.11443E-08	2.88497E-06
Dermal contact with groundwater	Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d	7.00E-05					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03
	Hazard Quotient	HQ	mg/kg-d						0.000682836		0.000261195						4.19027E-05	0.000158283	2.18594E-05	1.3865E-05	0.300364356	1.55722E-06	0.001442485
	Total Hazard Index	HI	mg/kg-d																				
Sum R <sub>c</sub>				fraction	8.01E-12	9.66E-12	4.17E-11	2.91E-11	7.81E-11	1.99E-08	9.72E-10	9.93E-11	1.58E-09	1.02E-11	1.73E-11	1.35E-08	0.00E+00	1.24E-10	5.65E-10	2.05E-11	0.00E+00	5.71E-11	0.00E+00
Sum HI				fraction	0	0	0	0	0.000683579	0	0.000309367	0	0	0	0	0	4.36476E-05	0.000159094	3.18879E-05	1.57781E-05	0.309055784	2.37956E-06	0.001546782



TABLE 7-12  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (MODERATE TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern															Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylbiphenylene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride				
Incidental Ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541			7.62E-08	53%
	POE concentration	C <sub>w</sub>	mg/m3	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	Water ingestion rate	IR	l/d																	
	Exposure frequency	EF	d/y																	
	Exposure duration	ED	y																	
	Body weight	BW	kg																	
	Averaging time carcinogens	AT <sub>c</sub>	d																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.20245E-13	1.59208E-12	1.4377E-12	3.69698E-12	4.52571E-13		7.92588E-10	8.56359E-11	9.28359E-09	8.72268E-12	1.27347E-09	2.81143E-08	4.18335E-10				
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01				
	Risk	R <sub>c</sub>	fraction	3.07E-12		1.12E-13	5.92E-12	3.30E-13				6.50E-08	1.05E-12	6.88E-10	5.62E-10	3.01E-10				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																	
Incidental Ingestion of groundwater	Average Intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	2.94171E-11	1.11446E-10	1.00639E-10	2.58789E-10	3.168E-11		5.54811E-08	5.99451E-09	6.49851E-07	6.10587E-10	8.91429E-08	0.000001968	2.92834E-08			1.58E-02	3%
	Ingestion Reference Dose	RfD <sub>inc</sub>	mg/kg-d	4.00E-03	2.00E-04	8.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d	2.78614E-08	5.03194E-07	3.23486E-07				2.77406E-06	1.1989E-05		2.03529E-08	8.91429E-06	0.00656	9.76114E-06				
	Total Hazard Index	HI	mg/kg-d																	
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.0000858	0.00032505	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541			6.78E-08	47%
	event duration	t <sub>event</sub>	hr																	
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	8.45671E-10	1.71575E-10	2.07871E-10	1.03006E-09	6.20134E-10		3.51617E-08	4.70403E-10	2.26317E-08	6.30557E-09	4.8138E-08	3.35764E-07	2.11254E-09				
	Event frequency	EV	events/day																	
	Exposure duration	ED	y																	
	Exposure frequency	EF	d/y																	
	Skin surface area	SA	cm2																	
	Body weight	BW	kg																	
	Averaging time	AT	d/y																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.4172E-10	6.93303E-11	8.39967E-11	4.16278E-10	2.50585E-10		1.42082E-08	1.90081E-10	9.14505E-09	2.54797E-09	1.94517E-08	1.35676E-07	8.53641E-10				
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	7.30E+00		7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01				
Dermal contact with groundwater	Risk	R <sub>d</sub>	fraction	2.49E-09		6.55E-12	6.66E-10	5.76E-11				1.65E-08	3.06E-10	1.05E-08	4.07E-10	6.15E-10				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																	
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	2.39204E-08	4.85312E-09	5.87977E-09	2.91359E-08	1.75409E-08		9.94575E-07	1.33057E-08	6.40154E-07	1.78358E-07	1.36162E-06	9.49732E-06	5.97548E-08			5.19E-01	97%
	Dermal Reference Dose	RfD <sub>dnc</sub>	mg/kg-d	4.00E-03	2.00E-04	8.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d	1.21328E-06	2.93989E-05	3.64199E-05				4.97287E-05	2.66113E-05		5.94525E-06	0.000136162	0.211051526	1.99183E-05				
	Total Hazard Index	HI	mg/kg-d																	
																			1.34E-07	
																			9.59E-09	
Sum R <sub>t</sub>				fraction	2.50E-09	0.00E+00	6.66E-12	6.72E-10	5.80E-11	0.00E+00	0.00E+00	8.14E-08	3.07E-10	1.12E-08	9.69E-10	9.16E-10	1.44E-07			
																			5.33E-01	
																			1.78E-03	
Sum HI				fraction	0	1.24114E-06	2.99021E-05	3.67434E-05	0	5.25028E-05	3.86004E-05	0	5.96561E-06	0.000145076	0.217611526	2.96794E-05	5.35E-01			



TABLE 7-13  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

								Chemicals of Potential Concern																	
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	2,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016		
Groundwater	Groundwater	Excavation	Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021			
				POE concentration	C <sub>w</sub>	mg/m3		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021			
				Water ingestion rate	IR	l/d	0.04																		
				Exposure frequency	EF	d/y	219																		
				Exposure duration	ED	y	1																		
				Body weight	BW	kg	70																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																		
				Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.1409E-11	1.8911E-10	2.82416E-09	7.34694E-09	9.79592E-09	3.32376E-10	1.77649E-10	1.6751E-08	1.2098E-08	4.464E-11	1.35816E-09	6.15184E-11	8.19918E-10	6.8782E-11	4.41845E-11			
				Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01		6.70E+00			4.50E-01		4.00E-01
				Risk	R	fraction		4.28E-12	1.08E-11				3.02E-11	1.21E-11		2.90E-10	4.91E-13	9.24E-10		4.12E-10			3.10E-11		
				Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																			
				Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.49863E-09	1.32377E-08	1.97691E-07	5.14286E-07	6.85714E-07	2.32663E-08	1.24354E-08	1.17257E-06	8.46857E-07	3.1248E-09	9.50709E-08	4.30629E-09	5.73943E-08	4.81474E-09	3.09291E-09			
				Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		7.00E-05	
				Hazard Quotient	HQ	mg/kg-d		2.49771E-08	3.30943E-06	1.97691E-06	5.14286E-05	6.85714E-05	1.16331E-06	1.13049E-05	3.90857E-05	2.82286E-05	0.000031248	4.75354E-05	4.30629E-06	1.14789E-05		3.09291E-05			
				Total Hazard Index	HI	mg/kg-d																			
			Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l		0.004371	0.03861	0.5766	1.5	2	0.06786	0.03627	3.42	2.47	0.009114	0.27729	0.01256	0.1674	0.014043	0.009021			
				event duration	t <sub>event</sub>	hr	4																		
				absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event		1.75629E-10	1.27153E-09	1.8216E-08	5.38343E-08	7.8367E-07	1.34258E-09	1.35765E-09	9.77486E-07	5.22286E-07	2.08078E-09	5.3639E-09	0	6.71769E-09	1.66318E-09	1.88164E-10			
				Event frequency	EF	events/day	1																		
				Exposure duration	ED	y	1																		
				Exposure frequency	EF	d/y	219																		
				Skin surface area	SA	cm2	3,300																		
				Body weight	BW	kg	70																		
				Averaging time	AT	d/y	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	365																		
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		7.09685E-11	5.138E-10	7.36074E-09	2.17535E-08	3.16667E-07	5.42512E-10	5.486E-10	3.94984E-07	2.11046E-07	8.40806E-10	2.16745E-09	0	2.7145E-09	6.7206E-10	7.60336E-11			
				Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01		6.70E+00		4.50E-01		4.00E-01	
				Risk	R	fraction		1.42E-11	2.93E-11				4.94E-11	3.73E-11		5.07E-09	9.25E-12	1.73E-09			3.02E-10				
				Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																			
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		4.96779E-09	3.5966E-08	5.15252E-07	1.52274E-06	2.21667E-05	3.79758E-08	3.8402E-08	2.76489E-05	1.47732E-05	5.88564E-08	1.51722E-07	0	1.90015E-07	4.70442E-08	5.32235E-09			
				Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04		7.00E-05	
Hazard Quotient	HQ	mg/kg-d		8.27966E-08	8.9915E-06	5.15252E-06	0.000152274	0.002216668	1.89879E-06	3.49109E-05	0.00092163	0.000492441	0.000588564	7.58608E-05	0	3.8003E-05		5.32235E-05							
Total Hazard Index	HI	mg/kg-d																							
Carcinogenic risk - all routes (detected organics)																									
Carcinogenic risk - all routes (undetected organics)																									
TOTAL CARCINOGENIC RISK - ALL ROUTES								Sum R <sub>c</sub>	fraction	1.85E-11	4.01E-11	0.00E+00	0.00E+00	0.00E+00	7.94E-11	4.94E-11	0.00E+00	5.36E-09	9.74E-12	2.66E-09	0.00E+00	3.33E-10	0.00E+00		
Non-Carcinogenic risk - all routes (detected organics)																									
Non-Carcinogenic risk - all routes (undetected organics)																									
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES								Sum HI	fraction	1.07774E-07	1.23009E-05	7.12943E-06	0.000203703	0.002285239	3.06211E-06	4.62159E-05	0.000960715	0.00052067	0.000619812	0.000123396	4.94818E-05	0	8.41527E-05		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter



TABLE 7-13  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1221	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenzo(a,h)Anthracene	Dibenzofuran	
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	POE concentration	C <sub>w</sub>	mg/m3	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.7982E-13	3.37714E-13	1.9298E-13	1.25437E-13	2.12278E-13	8.68408E-12	2.75265E-09	1.37016E-12	1.27367E-12	7.85535E-13	4.52571E-13	6.87673E-09	9.97127E-10	2.31576E-10	2.86531E-09	1.91314E-11	2.48327E-06	2.34955E-10	1.48996E-08	4.20245E-13	1.59208E-12	
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00	
Risk	R	fraction	1.12E-13	1.35E-13	7.72E-14	5.02E-14	8.49E-14	3.47E-12	1.51E-10	1.00E-12	9.30E-12	5.73E-13	3.30E-14	7.56E-09		3.24E-12	1.78E-10	2.49E-12		1.97E-11		3.07E-12			
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																							
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00005713	0.00006895	0.0000394	0.00002561	0.00004334	0.001773	0.562	0.00027974	0.00026004	0.00016038	0.0000924	1.404	0.20358	0.04728	0.585	0.003906	507	0.04797	3.042	0.0000858	0.00032505	
	event duration	t <sub>event</sub>	hr																						
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	4.88352E-11	5.8939E-11	2.57757E-10	1.79727E-10	4.82814E-10	1.23352E-07	3.69367E-08	1.03553E-09	1.68035E-09	1.03288E-09	5.86572E-10	1.32975E-08	5.92563E-08	2.12643E-08	1.54561E-08	3.43123E-10	6.58374E-05	1.10106E-09	1.01994E-07	8.45671E-10	1.71575E-10	
	Event frequency	EV	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.97334E-11	2.38162E-11	1.04155E-10	7.26243E-11	1.95096E-10	4.98444E-08	1.49255E-08	4.18437E-10	6.66875E-10	4.17367E-10	2.37023E-10	5.37329E-09	2.39444E-08	8.59251E-09	6.24553E-09	1.3865E-10	2.66037E-05	4.44919E-10	4.12139E-08	3.4172E-10	6.93303E-11		
Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		
Risk	R	fraction	7.89E-12	9.53E-12	4.17E-11	2.90E-11	7.80E-11	1.99E-08	8.21E-10	9.83E-11	1.57E-09	9.60E-12	1.73E-11	5.91E-09		1.20E-10	3.87E-10	1.80E-11		3.74E-11		2.49E-09			
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																							
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.38134E-09	1.66713E-09	7.29083E-09	5.0837E-09	1.36567E-08	3.48911E-06	1.04478E-06	2.92906E-08	4.66812E-08	2.92157E-08	1.65916E-08	3.7613E-07	1.67611E-06	6.01476E-07	4.37187E-07	9.70549E-09	0.001862259	3.11443E-08	2.88497E-06	2.39204E-08	4.85312E-09		
Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03		
Hazard Quotient	HQ	mg/kg-d					0.000682836		0.000261195						4.19027E-05	0.000158283	2.18594E-05	1.3865E-05	0.300364356	1.55722E-06	0.001442485		1.21328E-06		
Total Hazard Index	HI	mg/kg-d																							
Sum RI				fraction	8.01E-12	9.66E-12	4.17E-11	2.91E-11	7.81E-11	1.99E-08	9.72E-10	9.93E-11	1.58E-09	1.02E-11	1.73E-11	1.35E-08	0.00E+00	1.24E-10	5.65E-10	2.05E-11	0.00E+00	5.71E-11	0.00E+00	2.50E-09	0.00E+00
Sum HI				fraction	0	0	0	0	0.000683579	0	0.000309367	0	0	0	0	0	4.36476E-05	0.000159094	3.18879E-05	1.57781E-05	0.309055784	2.37956E-06	0.001546782	0	1.24114E-06



TABLE 7-13  
CTE RISK CALCULATIONS FOR OFF-SITE CONSTRUCTION WORKER (LOW TCE SLOPE FACTOR)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern													Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Hexachloro-1,3-butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride				
Incidental ingestion of groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	POE concentration	C <sub>w</sub>	mg/m3	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	Water ingestion rate	IR	l/d															
	Exposure frequency	EF	d/y															
	Exposure duration	ED	y															
	Body weight	BW	kg															
	Averaging time carcinogens	AT <sub>c</sub>	d															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.4377E-12	3.69698E-12	4.52571E-13		7.92588E-10	8.56359E-11	9.28359E-09	8.72268E-12	1.27347E-09	2.81143E-08	4.18335E-10				
	Ingestion Cancer Slope Factor	CSF <sub>c</sub>	kg-d/mg	7.80E-02	1.60E+00	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01				
	Risk	R	fraction	1.12E-13	5.92E-12	3.30E-13				6.50E-08	1.05E-12	6.88E-10	1.69E-10	3.01E-10				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												7.58E-08	53%		
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.00639E-10	2.58789E-10	3.168E-11		5.54811E-08	5.99451E-09	6.49851E-07	6.10587E-10	8.91429E-08	0.000001968	2.92834E-08				
Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03					
Hazard Quotient	HQ	mg/kg-d	5.03194E-07	3.23486E-07			2.77406E-06	1.1989E-05		2.03529E-08	8.91429E-06	0.00656	9.76114E-06					
Total Hazard Index	HI	mg/kg-d												1.58E-02	3%			
Dermal contact with groundwater	POE concentration	C <sub>w</sub>	ug/l	0.00029353	0.0007548	0.0000924		0.16182	0.017484	1.8954	0.00178088	0.26	5.74	0.08541				
	event duration	t <sub>event</sub>	hr															
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	2.07871E-10	1.03006E-09	6.20134E-10		3.51617E-08	4.70403E-10	2.26317E-08	6.30557E-09	4.8138E-08	3.35764E-07	2.11254E-09				
	Event frequency	EF	events/day															
	Exposure duration	ED	y															
	Exposure frequency	EF	d/y															
	Skin surface area	SA	cm2															
	Body weight	BW	kg															
	Averaging time	AT	d/y															
	Averaging time non-carcinogens	AT <sub>nc</sub>	d															
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	8.39967E-11	4.16228E-10	2.50585E-10		1.42082E-08	1.90081E-10	9.14505E-09	2.54797E-09	1.94517E-08	1.35676E-07	8.53641E-10				
	Dermal Cancer Slope Factor	CSF <sub>d</sub>	kg-d/mg	7.80E-02	1.60E+00	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01				
	Risk	R	fraction	6.55E-12	6.66E-10	5.76E-11				1.65E-08	3.06E-10	1.05E-08	1.22E-10	6.15E-10				
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												6.76E-08	47%			
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	5.87977E-09	2.91399E-08	1.75409E-08		9.94575E-07	1.33057E-06	6.40154E-07	1.78358E-07	1.36162E-06	9.49732E-06	5.97548E-08					
Dermal Reference Dose	RfD <sub>inh</sub>	mg/kg-d	2.00E-04	8.00E-04		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03					
Hazard Quotient	HQ	mg/kg-d	2.93989E-05	3.64199E-05			4.97287E-05	2.66113E-05		5.94528E-06	0.000136162	0.211051526	1.99183E-05					
Total Hazard Index	HI	mg/kg-d												6.19E-01	97%			
																	1.33E-07	
																	9.59E-09	
Sum Rt			fraction	6.66E-12	6.72E-10	5.80E-11		0.00E+00	0.00E+00	8.14E-08	3.07E-10	1.12E-08	2.91E-10	9.16E-10	1.43E-07			
																	5.33E-01	
																	1.78E-03	
Sum HI			fraction	2.99021E-05	3.67434E-05	0		5.25028E-05	3.86004E-05	0	5.96561E-06	0.000145076	0.217611526	2.96794E-05	5.35E-01			



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

Chemicals of Potential Concern																									
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	
				POE concentration	C <sub>air</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13466E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
				Average Intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	
				Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01									
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05									
				Total Hazard Index	HI	mg/kg-d																			
Groundwater	Tap Water	Ingestion of tap water	Ingestion of tap water	POE concentration	C <sub>sw</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				POE concentration	C <sub>sw</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Water ingestion rate	IR	l/d	1																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.69123E-07	8.46247E-07	3.55014E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	5.61151E-07	6.07759E-06	7.73151E-07	1.03068E-05	8.6463E-07	5.55425E-07	1.25479E-06	7.27781E-07	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R	fraction		5.38E-08	4.82E-08				1.35E-07	5.41E-08		6.53E-06	6.17E-09	4.13E-06	5.18E-06		3.89E-07		5.02E-07	2.91E-07	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
				Average Intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		3.13977E-06	9.87288E-06	0.000414183	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	6.54676E-06	7.09052E-05	9.02009E-06	0.000120247	1.00874E-05	6.47995E-06	1.46393E-05	8.49078E-06	
				Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		5.23295E-05	0.002468219	0.004141826	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.065446758	0.035452603	0.009020091	0.024049315		0.064799543	0.20913242		
				Total Hazard Index	HI	mg/kg-d																			
		Dermal contact with tap water	Dermal contact with tap water	POE concentration	C <sub>sw</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				event duration	t <sub>event</sub>	hr	1																		
				absorbed dose per event	D <sub>abs</sub>	mg/cm2-event		9.08634E-10	2.12216E-09	7.68822E-08	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	1.14437E-08	1.00576E-08		3.10776E-08	9.3442E-09	1.01879E-09		5.67678E-08	
				Event frequency	EF	events/day	1																		
				Exposure duration	ED	y	6																		
				Exposure frequency	EF	d/y	350																		
				Skin surface area	SA	cm2	6,600																		
				Body weight	BW	kg	15																		
				Averaging time	AT	d/y	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		3.28602E-08	7.67467E-08	2.7804E-06	5.31769E-06	0.000422559	7.25641E-08	7.61936E-08	0.000214587	0.000175526	4.13853E-07	3.63728E-07	0	1.1239E-06	3.7927E-07	3.68439E-08	0	2.05297E-06	
				Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R	fraction		6.57E-09	4.37E-09				6.60E-09	5.18E-09		4.21E-06	4.55E-09	2.91E-07	0.00E+00		1.52E-07		0.00E+00	8.21E-07	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		3.83369E-07	8.95378E-07	3.2438E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	4.82829E-06	4.24349E-06	0	1.31122E-05	3.94248E-06	4.29846E-07	0	2.39513E-05	
				Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d		6.38948E-06	0.000223845	0.00032438	0.006203967	0.492985057	4.23295E-05	0.000808114	0.083450362	0.048260247	0.048282863	0.002121746	0	0.002622435		0.00429846	0						
Total Hazard Index	HI	mg/kg-d																							
Air	Indoor Air	Vapors from tap water	Vapors from tap water	Concentration in tap water	C <sub>sw</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Concentration in tap water	C <sub>sw</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Volatilization factor	VF	dimensionless	0.0005 y																		
				POE concentration	C <sub>air</sub>	mg/m3		2.45575E-05	0.00007722	0.0032395	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.0009405	0	0	0.0001145	0	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour intrusion - Inhalation	POE concentration	C <sub>p-in</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>p-in</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00			5.20E-02	5.20E-02	8.10E-02	8.10E-02	8.10E-02	3.08E-01	3.25E-07	7.70E-02	1.61E+00
	Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08			8.73E-11	8.73E-11	5.06E-08	5.06E-08	5.06E-08	0.00E+00	3.18E-12	3.18E-12	1.07E-10
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.98893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	
Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d						0.000163164										0.057615471							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	Water ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	8.78356E-07	5.01918E-07	3.26247E-07	5.5211E-07	2.25863E-05	0.000414999	3.56362E-06	3.31266E-06	5.05307E-06	2.91123E-06	3.07726E-05	4.46203E-06	0.0006022301	1.28219E-05	2.40493E-07	0.015896877	1.0514E-06	6.6674E-05	2.70329E-06	4.14082E-06	3.79929E-06	3.71419E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00			1.40E-02	6.20E-02	1.30E-01	8.40E-02	8.40E-02	7.30E+00	7.80E-02	7.80E-02	1.60E+00
	Risk	R	fraction	3.51E-07	2.01E-07	1.30E-07	2.21E-07	9.03E-06	2.28E-05	2.60E-06	2.42E-05	3.69E-06	2.13E-07	3.38E-05			8.43E-06	7.95E-07	3.13E-08	8.83E-08	1.97E-05		2.92E-07	2.92E-07	5.94E-06
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.02475E-05	5.85571E-06	3.80621E-06	6.44128E-06	0.000263507	0.004841187	4.15755E-05	3.86477E-05	5.89525E-05	3.39644E-05	0.000359014	5.2057E-05	0.007026849	0.000149589	2.80575E-06	0.185463562	1.22663E-05	0.000777863	3.15384E-05	4.83096E-05	4.3625E-05	4.33322E-05
Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d				0.322063927		1.210296804						0.001301425	0.351342466	0.007479452	0.004008219	9.273178082	0.000613315	0.077786301	0.012077397	0.218125114	0.054165297		
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	event duration	tevent	hr																						
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	6.85129E-08	2.99626E-07	2.08921E-07	5.6124E-07	0.000143389	1.76209E-06	1.20373E-06	1.91842E-06	2.96952E-06	1.6864E-06	2.26685E-08	1.1527E-07	2.47184E-05	2.80879E-08	1.7439E-09	0.000152749	2.14049E-09	1.6194E-07	2.4313E-06	1.98459E-07	2.41637E-07	4.62517E-07
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	2.47773E-06	1.08358E-05	7.5555E-06	2.02969E-05	0.00518558	6.37248E-05	4.35323E-05	6.93786E-05	0.000107391	6.09875E-05	8.19794E-07	4.16866E-06	0.000893926	1.01578E-06	6.30671E-08	0.0055324088	7.74093E-08	5.85645E-06	8.79266E-05	7.17714E-06	8.73864E-06	1.67266E-05
	D																								



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	5.52E-07	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.59E-07		0%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.7720E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										1.1E-05		0%
Ingestion of tap water	POE concentration	C <sub>sw</sub>	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164			
	POE concentration	C <sub>sw</sub>	mg/m3	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.91123E-06	8.24658E-07	9.96329E-06	1.07649E-06	4.1543E-05	2.26867E-05	2.95342E-05	8.35616E-05	0.000001872			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01			
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	3.34E-05	1.35E-06			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										4.96E-06		11%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.39644E-05	9.621E-06	0.000116228	1.25591E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0.002405251	0.005811918	0.025118174		0.0088226	0.034456621	3.249619482	0.00728			
	Total Hazard Index	HI	mg/kg-d										1.59E-01		13%
Dermal contact with tap water	POE concentration	C <sub>sw</sub>	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	1.78289E-06	0	1.74988E-07	2.11446E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09			
	Event frequency	EF	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	6.4477E-05	0	6.32833E-06	7.64683E-08	1.33804E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01			
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	8.11E-07	7.31E-08			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										3.02E-05		69%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000752231	0	7.38305E-05	8.9213E-07	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	0.003691527	0.00178426		0.103086176	0.020003964	3.506007297	0.000395006			
	Total Hazard Index	HI	mg/kg-d										3.09E+01		25%
Vapors from tap water not those with a "Y"	Concentration in tap water	C <sub>sw</sub>	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164			
	Concentration in tap water	C <sub>sw</sub>	mg/m3	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air</sub>	mg/m3	0	0.00007525	0.000090915	0.00009823	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	4.15627E-06	5.0215E-05	5.42553E-06	0	0	0.000148853	0.000421151	9.43488E-06			



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,5-Dichlorobenzonitrile	4,6-Dinitro-2-Methyl Phenol	Acroton-1016	Acroton-1221			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01			
				Risk	R	fraction		2.75E-07	2.43E-07				6.82E-07			3.01E-05	0.00E+00							2.53E-06	0.00E+00		
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		1.58244E-05	4.97593E-05	0.002087481	0.003534444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.015987156	0	0	0	0.000606043	0	0	7.37819E-05	0			
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01											
				Hazard Quotient	HQ	mg/kg-d						17.10442682	0.062466384	0.041003143		0.069509375											
				Total Hazard Index	HI	mg/kg-d																					
				Surface Water	Creek	Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
							POE concentration	C <sub>w</sub>	mg/m3		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
							Water ingestion rate	IR	l/d	0.05																	
Exposure frequency	EF	d/y	52																								
Exposure duration	ED	y	6																								
Body weight	BW	kg	15																								
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																								
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																								
Average Intake from Ingestion carcinogens	I <sub>h</sub>	mg/kg-d					1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14				
Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg					2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01				
Risk	R	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15							
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
Average Intake from Ingestion non-carcinogens	I <sub>h</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13							
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05								
Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09								
Total Hazard Index	HI	mg/kg-d																									
		Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
			event duration	t <sub>event</sub>	hr	2																					
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event		1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13				
			Event frequency	EV	events/day	1																					
			Exposure duration	ED	y	6																					
			Exposure frequency	EF	d/y	52																					
			Skin surface area	SA	cm2	6,600																					
			Body weight	BW	kg	15																					
			Averaging time	AT	d/y	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
Absorbed dose for carcinogens	DAD <sub>nc</sub>	mg/kg-d		5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13							
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01							
Risk	R	fraction		1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13							
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12							
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05								
Hazard Quotient	HQ	mg/kg-d		1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-07	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0								
Total Hazard Index	HI	mg/kg-d																									
Carcinogenic risk - all routes (detected organics)																											
Carcinogenic risk - all routes (undetected organics)																											
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		3.36E-07	2.96E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	1.07E-08	4.42E-06	5.18E-06	0.00E+00	5.41E-07	0.00E+00	3.03E-06	1.11E-06				
Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		5.87204E-05	0.002692128	0.00444629	0.076361895	17.9866156	0.063446717	0.050302792	0.177305719	0.243625516	0.113758823	0.037575024	0.009020144	0.02667235	0	0.069099095	0.209132423	0				

Notes  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liter per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	Di(2-Chloroethyl) Ether	Di(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Incidental Ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00					5.20E-02						
	Risk	R	fraction	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04					6.30E-08			8.10E-02	3.08E-01	7.70E-02	1.61E+00
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																6.30E-08			2.72E-05	0.00E+00	1.45E-06	3.01E-05
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.95128E-05	0	3.2464E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	1.4141E-05	0.934734351	6.18222E-05	0.00392043	0	0.00024348	0.00021987	0.000218394
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02						
Dermal contact with creek water	Hazard Quotient	HQ	mg/kg-d					2.847092598										54.98449122							
	Total Hazard Index	HI	mg/kg-d																						
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	Water Ingestion rate	IR	l/d																						
Incidental Ingestion of creek water	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
Dermal contact with creek water	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00					
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13	6.24E-13	1.45E-15					
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.6841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d					2.00E-05							4.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	2.00E-02	1.00E-02				
	Hazard Quotient	HQ	mg/kg-d				4.467E-09	4.33179E-07							9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07	1.67513E-10	3.02538E-09	2.37824E-09	
	Total Hazard Index	HI	mg/kg-d																						
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	event duration	t <sub>event</sub>	hr																						
Dermal contact with creek water	absorbed dose per event	D <sub>abs</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86409E-12
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
Dermal contact with creek water	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00					
Dermal contact with creek water	Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12	1.30E-12	1.34E-12					
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03				
	Hazard Quotient	HQ	mg/kg-d				4.64479E-06	2.13966E-06							2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06	8.21216E-09	1.99977E-07	3.02932E-07	
Dermal contact with creek water	Total Hazard Index	HI	mg/kg-d																						
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	event duration	t <sub>event</sub>	hr																						
	absorbed dose per event	D <sub>abs</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86409E-12
	Event frequency	EF	events/day																					</	



TABLE 7-14  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg traction	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	1.68E-04	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										6.67E-04		20%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	4.84899E-05	0.000585841	6.32978E-05	0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.683595467	0.110854286			0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d										7.44E+01		62%
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029334582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029334582	0.000325004			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg traction	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	4.78E-10	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										3.20E-09		0%
	Average Intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d										9.92E-08		0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029334582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg traction	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	3.44E-10	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										8.51E-09		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d										2.84E-03		0%
Carcinogenic risk - all routes (detected organics)														3.35E-03	
Carcinogenic risk - all routes (undetected organics)														1.03E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	1.70E-05	0.00E+00	0.00E+00	0.00E+00	2.93E-04	3.45E-05	3.38E-04	2.03E-04	1.71E-06	4.39E-03
Non-Carcinogenic risk - all routes (detected organics)														1.09E+02	
Non-Carcinogenic risk - all routes (undetected organics)														1.38E+01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0.002405225	0.693306348	0.137764936	0	0.111908816	0.066871694	7.189574261	0.011544967	1.23E+02

TCE slope factor



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																	
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00
				POE concentration	C <sub>POE</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00
				Inhalation rate	IR	m3/hr	0.42																	
				Exposure time	ET	h/d	24																	
				Exposure frequency	EF	d/y	350																	
				Exposure duration	ED	y	6																	
				Body weight	BW	kg	15																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																	
				Average Intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0
				Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01								
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05								
				Total Hazard Index	HI	mg/kg-d																		
Groundwater	Tap Water		Ingestion of tap water	POE concentration	C <sub>POE</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
				POE concentration	C <sub>POE</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
				Water Ingestion rate	IR	l/d	1																	
				Exposure frequency	EF	d/y	350																	
				Exposure duration	ED	y	6																	
				Body weight	BW	kg	15																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																	
				Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.69123E-07	8.46247E-07	3.55014E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	5.61151E-07	6.07759E-06	7.73151E-07	1.03048E-05	8.6463E-07	5.55425E-07	1.25479E-06	7.27781E-07
				Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
				Risk	R	fraction		5.38E-08	4.82E-08				1.35E-07	5.41E-08		6.53E-06	6.17E-09	4.13E-06	5.18E-06		3.89E-07		5.02E-07	2.91E-07
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		3.13977E-06	9.87288E-06	0.000414183	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	6.54676E-06	7.09052E-05	9.02009E-06	0.000120247	1.00874E-05	6.47995E-06	1.46393E-05	8.49078E-06
				Ingestion Reference Dose	RTD <sub>ing</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
				Hazard Quotient	HQ	mg/kg-d		5.23295E-05	0.002468219	0.004141826	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.06546758	0.035452603	0.009020091	0.024049315		0.064799543	0.20913242	
				Total Hazard Index	HI	mg/kg-d																		
			Dermal contact with tap water	POE concentration	C <sub>POE</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
				event duration	tevent	hr	1																	
				absorbed dose per event	Dosevent	mg/cm2-event		9.08634E-10	2.12216E-09	7.68822E-08	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	1.14437E-08	1.00576E-08	0	3.10776E-08	9.3442E-09	1.01879E-09	0	5.67678E-08
				Event frequency	EV	events/day	1																	
				Exposure duration	ED	y	6																	
				Exposure frequency	EF	d/y	350																	
				Skin surface area	SA	cm2	6,600																	
				Body weight	BW	kg	15																	
				Averaging time	AT	d/y	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																	
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		3.28602E-08	7.67467E-08	2.7804E-06	5.31769E-06	0.000422559	7.25641E-08	7.61936E-08	0.000214587	0.000175526	4.13853E-07	3.63728E-07	0	1.1239E-06	3.37927E-07	3.68439E-08	0	2.05297E-06
				Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
				Risk	R	fraction		6.57E-09	4.37E-09				6.60E-09	5.18E-09		4.21E-06	4.55E-09	2.91E-07	0.00E+00		1.52E-07		0.00E+00	8.21E-07
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		3.83369E-07	8.95378E-07	3.2438E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	4.82829E-06	4.24349E-06	0	1.31122E-05	3.94248E-06	4.29846E-07	0	2.39513E-05
				Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
				Hazard Quotient	HQ	mg/kg-d		6.38948E-06	0.000223845	0.00032438	0.006203967	0.492985057	4.2329E-05	0.000808114	0.083450362	0.068260247	0.048282663	0.002121746	0	0.002622435		0.00429846	0	
Total Hazard Index	HI	mg/kg-d																						
[only calculated for COPC with Henry's Law > 1e-5 atm.m3/mol, those with a "Y"]	Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>POE</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
				Concentration in tap water	C <sub>POE</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
				Volatilization factor	VF	dimensionless	0.0005 y																	
				POE concentration	C <sub>POE-veg</sub>	mg/m3		2.45575E-05	0.00007722	0.0032395	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.0009405	0	0	0.0001145	0
				Inhalation rate	IR	m3/hr	0.42																	
				Exposure time	ET	h/d	24																	
				Exposure frequency	EF	d/y	350																	
				Exposure duration	ED	y	6																	
				Body weight	BW	kg	15																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550										</							



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE YCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz[a,h]anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene		
Vapour intrusion - inhalation	POE concentration	$C_{air}$	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06		
	POE concentration	$C_{soil}$	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09		
	Inhalation rate	IR	m3/hr																								
	Exposure time	ET	h/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	$AT_c$	d																								
	Averaging time non-carcinogens	$AT_{nc}$	d																								
	Average Intake from Inhalation carcinogens	$I_h$	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11		
Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00			
Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10			
Total carcinogenic risk for exposure route	$R_i$	fraction																									
Average Intake from Inhalation non-carcinogens	$I_h$	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.98893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10			
Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d						8.57E-03																			
Hazard Quotient	HQ	mg/kg-d						0.000163164																			
Total Hazard Index	HI	mg/kg-d																									
Ingestion of tap water	POE concentration	$C_w$	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784		
	POE concentration	$C_w$	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784		
	Water Ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	$AT_c$	d																								
	Averaging time non-carcinogens	$AT_{nc}$	d																								
	Average Intake from Ingestion carcinogens	$I_h$	mg/kg-d	8.78356E-07	5.01918E-07	3.26247E-07	5.5211E-07	2.25863E-05	0.000414959	3.56362E-06	3.31266E-06	5.05307E-06	2.91123E-06	3.07726E-05	4.46203E-06	0.000602301	1.28219E-05	2.40493E-07	0.015896877	1.0514E-06	6.6674E-05	2.70329E-06	4.14082E-06	3.79929E-06	3.71419E-06		
	Ingestion Cancer Slope Factor	$CSF_o$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00		
Risk	R	fraction	3.51E-07	2.01E-07	1.30E-07	2.21E-07	9.03E-06	2.28E-05	2.60E-06	2.42E-05	3.69E-06	2.13E-07	3.38E-05		8.43E-06	7.95E-07	3.13E-08		8.83E-08		1.97E-05		2.92E-07	5.94E-06			
Total carcinogenic risk for exposure route	$R_i$	fraction																									
Average Intake from Ingestion non-carcinogens	$I_h$	mg/kg-d	1.02475E-05	5.85571E-06	3.80621E-06	6.44128E-06	0.000263507	0.004841187	4.15755E-05	3.86477E-05	5.89525E-05	3.39644E-05	0.000339014	5.2057E-05	0.007026849	0.000149589	2.80575E-06	0.185463562	1.22663E-05	0.000777863	3.15384E-05	4.83096E-05	4.3625E-05	4.33322E-05			
Ingestion Reference Dose	$RfD_o$	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04			
Hazard Quotient	HQ	mg/kg-d				0.322063927		1.210296804						0.001301425	0.351342466	0.007479452	0.004008219	9.273178082	0.000613315	0.077786301		0.012077397	0.218125114	0.054165297			
Total Hazard Index	HI	mg/kg-d																									
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784		
	event duration	$t_{event}$	hr																								
	absorbed dose per event	$D_{event}$	mg/cm2-event	6.85129E-08	2.99626E-07	2.08921E-07	5.6124E-07	0.000143389	1.76209E-06	1.20373E-06	1.91842E-06	2.96952E-06	1.6844E-06	2.26685E-08	1.1527E-07	2.47184E-05	2.80879E-08	1.7439E-09	0.000152749	2.14049E-09	1.6194E-07	2.4313E-06	1.98459E-07	2.41637E-07	4.62517E-07		
	Event frequency	EF	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								
	Averaging time non-carcinogens	$AT_{nc}$	d																								
Absorbed dose for carcinogens	$DAD_o$	mg/kg-d	2.47773E-06	1.08358E-05	7.5555E-06	2.02969E-05	0.00518558	6.37248E-05	4.35323E-05	6.93786E-05	0.000107391	6.09876E-05	8.19794E-07	4.16866E-06	0.000893926	1.01578E-06	6.30671E-08	0.005524088	7.74093E-08	5.85645E-06	8.79266E-05	7.17714E-06	8.73864E-06	1.67266E-05			
Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.								



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour intrusion - Inhalation	POE concentration	C <sub>soil</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	2.76E-08	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										2.38E-07		0%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										6.63E-05		0%
Ingestion of tap water	POE concentration	C <sub>soil</sub>	ug/l	0.5313	0.1505	1.8183	0.19644	7.5816	4.14032	5.39	15.25	0.34164			
	POE concentration	C <sub>air</sub>	mg/m3	0.5313	0.1505	1.8183	0.19644	7.5816	4.14032	5.39	15.25	0.34164			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.91123E-06	8.24658E-07	9.96329E-06	1.07649E-06	4.1543E-05	2.26867E-05	2.95342E-05	8.35616E-05	0.000001872			
	Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01			
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	1.67E-06	1.35E-06			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										4.48E-06		11%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.39644E-05	9.621E-06	0.000116238	1.25591E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184			
	Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0.002405251	0.005811918	0.025118174		0.0088226	0.034456621	3.249619482	0.00728			
	Total Hazard Index	HI	mg/kg-d										1.39E-01		13%
Dermal contact with tap water	POE concentration	C <sub>soil</sub>	ug/l	0.5313	0.1505	1.8183	0.19644	7.5816	4.14032	5.39	15.25	0.34164			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>asvent</sub>	mg/cm2-event	1.78289E-06	0	1.74988E-07	2.11446E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>car</sub>	mg/kg-d	6.4477E-05	0	6.32833E-06	7.64683E-08	1.33806E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01			
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	4.06E-08	7.31E-08			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										3.02E-06		72%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000752231	0	7.38305E-05	8.9213E-07	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	0.003691527	0.00178426		0.103066176	0.020003964	3.506007297	0.000395006			
	Total Hazard Index	HI	mg/kg-d										3.03E+01		25%
Vapors from tap water  not those with a "Y"	Concentration in tap water	C <sub>soil</sub>	ug/l	0.5313	0.1505	1.8183	0.19644	7.5816	4.14032	5.39	15.25	0.34164			
	Concentration in tap water	C <sub>air</sub>	mg/m3	0.5313	0.1505	1.8183	0.19644	7.5816	4.14032	5.39	15.25	0.34164			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>soil</sub>	mg/m3	0	0.00007525	0.00090915	0.00009823	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	4.15627E-06	5.0215E-05	5.42553E-06	0	0	0.000148853	0.000421151	9.43488E-06			



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant- Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02		2.20E-02	1.09E-02							4.00E-01	4.00E-01	
				Risk	R	fraction		2.75E-07	2.43E-07				6.82E-07		3.01E-05	0.00E+00							2.53E-06	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		1.58244E-05	4.97593E-05	0.002087481	0.003534444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.019987156	0	0	0	0.000606043	0	0	7.37819E-05	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d					1.14E-03	1.40E-03	1.14E-03		2.30E-01										
				Hazard Quotient	HQ	mg/kg-d					17.10442682	0.062468384	0.041003143		0.069509375										
				Total Hazard Index	HI	mg/kg-d																			
Surface Water	Creek	Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07		
			POE concentration	C <sub>w</sub>	mg/m3		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07		
			Water Ingestion rate	IR	l/d	0.05																			
			Exposure frequency	EF	d/y	52																			
			Exposure duration	ED	y	6																			
			Body weight	BW	kg	15																			
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																			
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																			
			Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14		
			Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01		
			Risk	R	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15		
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																				
			Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13		
			Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05			
			Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09			
			Total Hazard Index	HI	mg/kg-d																				
		Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07		
			event duration	t <sub>event</sub>	hr	2																			
			absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event		1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13		
			Event frequency	EV	events/day	1																			
			Exposure duration	ED	y	6																			
			Exposure frequency	EF	d/y	52																			
			Skin surface area	SA	cm2	6,600																			
			Body weight	BW	kg	15																			
			Averaging time	AT	d/y	25,550																			
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																			
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13		
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01		
			Risk	R	fraction		1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13		
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																				
			Absorbed dose for non-carcinogens	DAD <sub>n</sub>	mg/kg-d		6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99456E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12		
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05			
Hazard Quotient	HQ	mg/kg-d		1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76099E-07	0.000112765	9.8209E-05	7.99656E-06	4.24076E-07	0	4.59033E-07		7.11907E-07	0						
Total Hazard Index	HI	mg/kg-d																							
Carcinogenic risk - all routes (detected organics)																									
Carcinogenic risk - all routes (undetected organics)																									
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		3.36E-07	2.94E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	1.07E-08	4.42E-06	5.18E-06	0.00E+00	5.41E-07	0.00E+00	3.03E-06	1.11E-06		
Non-Carcinogenic risk - all routes (detected organics)																									
Non-Carcinogenic risk - all routes (undetected organics)																									
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		5.87284E-05	0.002692128	0.00446629	0.076361895	17.9866156	0.063466717	0.050302792	0.177305719	0.243625516	0.113758823	0.037575024	0.009020144	0.02667235	0	0.069099095	0.209132423	0		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event

MEW Site File  
3DISC100200



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00					5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00	
	Risk	R	fraction	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04					6.30E-08			2.72E-05	0.00E+00		1.45E-06	3.01E-05	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																								
	Average Intake from inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.95128E-05	0	3.2444E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	1.4141E-05	0.934734351	6.18222E-05	0.00392043	0	0.00024348	0.00021987	0.000218394		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02								
Incidental ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					2.847092598										54.98449122									
	Total Hazard Index	HI	mg/kg-d																								
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	Water ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
	Average Intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63077E-13		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00													
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10													
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																								
	Average Intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12		
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d						4.00E-03																		
	Hazard Quotient	HQ	mg/kg-d						4.467E-09																		
Dermal contact with creek water	Total Hazard Index	HI	mg/kg-d					4.33179E-07																			
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	event duration	t <sub>event</sub>	hr																								
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12		
	Event frequency	EV	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
		Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70644E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	
		Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00												
		Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10												
Total carcinogenic risk for exposure route		R <sub>t</sub>	fraction																								
Absorbed dose for non-carcinogens		DAD <sub>nc</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.53864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d					2.00E-05																			
	Hazard Quotient	HQ	mg/kg-d					4.64479E-06																			
	Total Hazard Index	HI	mg/kg-d						2.13966E-06																		
Carcinogenic risk - all routes (detected organics)																											
Carcinogenic risk - all routes (undetected organics)																											
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	1.34E-06	5.55E-06	3.15E-06	9.45E-06	2.13E-03	8.34E-05	1.28E-05	1.87E-04	1.40E-05	4.66E-06	2.15E-04	0.00E+00	2.09E-05	8.58E-07	1.03E-07	0.00E+00	9.48E-08	2.73E-05	6.62E-04	0.00E+00	6.28E-05	
Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	12.16192855	0	4.243419059	0	0	0	0	0.002517535	3.09585243	0.008072162	0.005059539	74.7111965	0.000258484	0.111954852	0	0.033010719	0.727879063	0.298095552	



TABLE 7-15  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	8.42E-06	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.69E-06		17%
	Average Intake from Inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d	0	4.84899E-05	0.000585841	6.32978E-05	0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.683595467	0.110854286			0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d										7.44E-01		62%
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>a</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	2.39E-11	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										2.76E-09		0%
	Average Intake from Ingestion non-carcinogens	I <sub>a</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d										9.93E-08		0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	1.72E-11	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										8.18E-09		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d										2.84E-03		0%
Carcinogenic risk - all routes (detected organics)														3.16E-03	
Carcinogenic risk - all routes (undetected organics)														1.03E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES														4.19E-03	
Non-Carcinogenic risk - all routes (detected organics)														1.09E-02	
Non-Carcinogenic risk - all routes (undetected organics)														1.38E-01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES														1.23E+02	

TCE slope factor

MEW Site File  
3DISC100202



TABLE 7-16  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	
				POE concentration	C <sub>air</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01									
				Hazard Quotient	HQ	mg/kg-d					0.002311867	8.83726E-05	5.99164E-05		1.72583E-05										
				Total Hazard Index	HI	mg/kg-d																			
Groundwater	Tap Water		Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				POE concentration	C <sub>w</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Water Ingestion rate	IR	l/d	1																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		2.69123E-07	8.46247E-07	3.55014E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	5.61151E-07	6.07759E-06	7.73151E-07	1.03068E-05	8.6463E-07	5.55425E-07	1.25479E-06	7.27781E-07	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R	fraction		5.38E-08	4.82E-08				1.35E-07	5.41E-08		6.53E-06	6.17E-09	4.13E-06	5.18E-06		3.89E-07		5.02E-07	2.91E-07	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		3.13977E-06	9.87288E-06	0.000414183	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	6.54676E-06	7.09052E-05	9.02009E-06	0.000120247	1.00874E-05	6.47995E-06	1.46393E-05	8.49078E-06	
				Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		5.23295E-05	0.002468219	0.004141826	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.06546758	0.035452603	0.009020091	0.024049315		0.064799543	0.20913242		
				Total Hazard Index	HI	mg/kg-d																			
							Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795
event duration	t <sub>event</sub>	hr	1																						
absorbed dose per event	D <sub>event</sub>	mg/cm2-event						9.08634E-10	2.12216E-09	7.68822E-08	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	1.14437E-08	1.00576E-08	0	3.10776E-08	9.3442E-09	1.01879E-09	0	5.67678E-08	
Event frequency	EV	events/day	1																						
Exposure duration	ED	y	6																						
Exposure frequency	EF	d/y	350																						
Skin surface area	SA	cm2	6,600																						
Body weight	BW	kg	15																						
Averaging time	AT	d/y	25,550																						
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d						3.28602E-08	7.67467E-08	2.7804E-06	5.31769E-06	0.000422559	7.25641E-08	7.61936E-08	0.000214587	0.000175526	4.13853E-07	3.63728E-07	0	1.1239E-06	3.37927E-07	3.68439E-08	0	2.05297E-06	
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
Risk	R	fraction						6.57E-09	4.37E-09				6.60E-09	5.18E-09		4.21E-06	4.55E-09	2.91E-07	0.00E+00		1.52E-07		0.00E+00	8.21E-07	
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d						3.83369E-07	8.95378E-07	3.2438E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	4.82829E-06	4.24349E-06	0	1.31122E-05	3.94248E-06	4.29846E-07	0	2.39513E-05	
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d						6.38948E-06	0.000223845	0.00032438	0.006203967	0.492985057	4.2329E-05	0.000808114	0.083450362	0.068260247	0.048282863	0.002121746	0	0.002622435		0.00429846	0		
Total Hazard Index	HI	mg/kg-d																							
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l			0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Concentration in tap water	C <sub>w</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282	
				Volatilization factor	VF	dimensionless	0.0005 y																		
				POE concentration	C <sub>air-tap</sub>	mg/m3		2.45575E-05	0.00007722	0.0032395	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.0009405	0	0	0.0001145	0	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550													</					







TABLE 7-16  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern									Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour intrusion - Inhalation	POE concentration	$C_{soil}$	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	$C_{air}$	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	$AT_c$	d											
	Averaging time non-carcinogens	$AT_{nc}$	d											
	Average intake from inhalation carcinogens	$I_c$	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08		
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02		
	Risk	R	fraction	0.00E+00						1.52E-07	8.28E-09	1.55E-09		
	Total carcinogenic risk for exposure route	$R_t$	fraction										2.65E-09	0%
	Average intake from inhalation non-carcinogens	$I_{nc}$	mg/kg-d	0	1.4112E-08	1.7720E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07		
	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02		
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05		
	Total Hazard Index	HI	mg/kg-d										2.20E-05	0%
Ingestion of tap water	POE concentration	$C_w$	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	POE concentration	$C_{soil}$	mg/m3	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Water ingestion rate	IR	l/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	$AT_c$	d											
	Averaging time non-carcinogens	$AT_{nc}$	d											
	Average intake from ingestion carcinogens	$I_c$	mg/kg-d	2.91123E-06	8.24658E-07	9.96329E-06	1.07649E-06	4.1543E-05	2.26867E-05	2.95342E-05	8.35616E-05	0.000001872		
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01		
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	5.01E-07	1.35E-06		
	Total carcinogenic risk for exposure route	$R_t$	fraction										4.65E-06	11%
	Average intake from ingestion non-carcinogens	$I_{nc}$	mg/kg-d	3.39644E-05	9.621E-06	0.000116298	1.25591E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184		
	Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d		0.002405251	0.005811918	0.025118174		0.0088226	0.034456621	3.249619482	0.00728		
	Total Hazard Index	HI	mg/kg-d										1.59E-01	13%
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	event duration	$t_{event}$	hr											
	absorbed dose per event	$D_{event}$	mg/cm2-event	1.78289E-06	0	1.74988E-07	2.11446E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09		
	Event frequency	EF	events/day											
	Exposure duration	ED	y											
	Exposure frequency	EF	d/y											
	Skin surface area	SA	cm2											
	Body weight	BW	kg											
	Averaging time	AT	d/y											
	Averaging time non-carcinogens	$AT_{nc}$	d											
	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	6.4477E-05	0	6.32833E-06	7.64683E-08	1.33806E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07		
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01		
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	1.22E-08	7.31E-08		
	Total carcinogenic risk for exposure route	$R_t$	fraction										3.02E-08	72%
	Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d	0.000752231	0	7.38305E-05	8.9213E-07	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06		
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d		0	0.003691527	0.00178426		0.103086176	0.020003964	3.506007297	0.000395006		
	Total Hazard Index	HI	mg/kg-d										3.05E+01	25%
Vapors from tap water	Concentration in tap water	$C_w$	ug/l	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Concentration in tap water	$C_{soil}$	mg/m3	0.5313	0.1505	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Volatilization factor	VF	dimensionless											
	POE concentration	$C_{soil}$	mg/m3	0	0.00007825	0.00090915	0.00009823	0	0	0.002695	0.007625	0.00017082		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	$AT_c$	d											
	Averaging time non-carcinogens	$AT_{nc}$	d											
	Average intake from inhalation carcinogens	$I_c$	mg/kg-d	0	4.15627E-06	5.0215E-05	5.42553E-06	0	0	0.000148853	0.000421151	9.43488E-06		
not those with a "Y"														



TABLE 7-16  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non-Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01			
				Risk	R	fraction		2.75E-07	2.43E-07				6.82E-07			3.01E-05	0.00E+00						2.53E-06	0.00E+00			
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		1.58244E-05	4.97593E-05	0.002087481	0.003534444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.015987156	0	0	0	0.000606043	0	0	7.37819E-05	0			
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01											
				Hazard Quotient	HQ	mg/kg-d					17.10442682	0.062468384	0.041003143		0.069509375												
				Total Hazard Index	HI	mg/kg-d																					
Surface Water	Creek	Incidental Ingestion of creek water	POE concentration	C <sub>sw</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			POE concentration	C <sub>sw</sub>	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			Water Ingestion rate	IR	l/d	0.05																					
			Exposure frequency	EF	d/y	52																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
			Average Intake from Ingestion carcinogens	I <sub>h</sub>	mg/kg-d			1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06284E-12	3.2523E-12	1.74052E-14	1.00943E-14			
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction			3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Average Intake from Ingestion non-carcinogens	I <sub>h</sub>	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13			
			Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09				
			Total Hazard Index	HI	mg/kg-d																						
		Dermal contact with creek water	POE concentration	C <sub>sw</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			event duration	t <sub>event</sub>	hr	2																					
			absorbed dose per event	D <sub>abs</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13			
			Event frequency	EF	events/day	1																					
			Exposure duration	ED	y	6																					
			Exposure frequency	EF	d/y	52																					
			Stn surface area	SA	cm2	6,600																					
			Body weight	BW	kg	15																					
			Averaging time	AT	d/y	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.62537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13			
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12			
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0							
Total Hazard Index	HI	mg/kg-d																									
Carcinogenic risk - all routes (detected organics)																											
Carcinogenic risk - all routes (undetected organics)																											
TOTAL CARCINOGENIC RISK - ALL ROUTES							Sum Rt	fraction			3.36E-07	2.94E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	1.07E-08	4.42E-06	5.18E-06	0.00E+00	5.41E-07	0.00E+00	3.03E-06	1.11E-06
Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES							Sum HI	fraction			5.87204E-05	0.002692128	0.00446629	0.076361895	17.9866156	0.063466717	0.050302792	0.177305719	0.243625516	0.113758823	0.037579824	0.009020144	0.02667235	0	0.069099095	0.209132423	0

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-16  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																								
Exposure Route	Parameter	Symbol	Units	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00			
	Risk	R	fraction	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04				6.30E-08			2.72E-05	0.00E+00		1.45E-06	3.01E-05			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.95128E-05	0	3.2464E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	1.4141E-05	0.934736351	6.18222E-05	0.00392043	0	0.00024348	0.00021987	0.000218394			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02									
Incidental ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					2.847092598										54.98449122										
	Total Hazard Index	HI	mg/kg-d																									
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	Water ingestion rate	IR	l/d																									
	Exposure frequency	EF	d/y																									
	Exposure duration	ED	y																									
	Body weight	BW	kg																									
	Averaging time carcinogens	AT <sub>c</sub>	d																									
	Averaging time non-carcinogens	AT <sub>n</sub>	d																									
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13			
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00			
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13		1.45E-15		4.05E-15	2.61E-13			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12			
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d					2.00E-05							4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04			
	Hazard Quotient	HQ	mg/kg-d					4.467E-09		4.33179E-07					9.19897E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09			
	Total Hazard Index	HI	mg/kg-d																									
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	event duration	t <sub>event</sub>	hr																									
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80970E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86409E-12			
	Event frequency	EF	events/day																									
	Exposure duration	ED	y																									
	Exposure frequency	EF	d/y																									
	Skin surface area	SA	cm2																									
	Body weight	BW	kg																									
	Averaging time	AT	d/y																									
	Averaging time non-carcinogens	AT <sub>n</sub>	d																									
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00			
Dermal contact with creek water	Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12		2.67E-13	3.32E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Absorbed dose for non-carcinogens	DAD <sub>n</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55844E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36848E-09	1.24844E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d					2.00E-05		4.00E-03					4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04			
	Hazard Quotient	HQ	mg/kg-d					4.64479E-06		2.13966E-06					2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07			
	Total Hazard Index	HI	mg/kg-d																									
	Carcinogenic risk - all routes (detected organics)																											
	Carcinogenic risk - all routes (undetected organics)																											
	TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	1.34E-06	5.55E-06	3.15E-06	9.45E-06	2.13E-03	8.34E-05	1.28E-05	1.87E-04	1.40E-05	4.66E-06	2.15E-04	0.00E+00	2.09E-05	8.58E-07	1.03E-07	0.00E+00	9.48E-08	2.73E-05	6.62E-04	0.00E+00	2.42E-06	6.28E-05
	Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																												
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	12.16192855	0	4.243419059	0	0	0	0	0.002517535	3.09585243	0.008072162	0.005059539	74.7111965	0.000658484	0.111956852	0	0.033010719	0.727879663	0.298095552		



TABLE 7-16  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	tetrachloroethene	trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	2.53E-06	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.01E-04		
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	4.84899E-05	0.000585841	6.32978E-05	0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.683595467	0.110854286			0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d										7.48E-03	62%	
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	7.16E-12	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										2.73E-09	0%	
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08				
	Total Hazard Index	HI	mg/kg-d									9.92E-08	0%		
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EF	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	5.16E-12	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										8.17E-09	0%	
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10				
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08				
	Total Hazard Index	HI	mg/kg-d									2.84E-03	0%		
Carcinogenic risk - all routes (detected organics)													3.15E-03		
Carcinogenic risk - all routes (undetected organics)													1.03E-03		
TOTAL CARCINOGENIC RISK - ALL ROUTES													4.18E-03		
Non-Carcinogenic risk - all routes (detected organics)													1.09E+02		
Non-Carcinogenic risk - all routes (undetected organics)													1.38E+01		
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES													1.23E+02		

TCE slope factor



TABLE 7-17  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Acroder-1016	Acroder-1221	Acroder-1232			
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>g-a</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	0.00E+00			
				POE concentration	C <sub>g-a</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	0.00E+00			
				Inhalation rate	IR	m3/hr	0.42																					
				Exposure time	ET	h/d	24																					
				Exposure frequency	EF	d/y	350																					
				Exposure duration	ED	y	6																					
				Body weight	BW	kg	15																					
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	0			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.09E-02										4.00E-01	4.00E-01	4.00E-01
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10		7.49E-09	0.00E+00										1.49E-12	0.00E+00	0.00E+00
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	0							
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01																
Hazard Quotient	HQ	mg/kg-d					0.002311867	8.83726E-05	5.99164E-05		1.72583E-05																	
Total Hazard Index	HI	mg/kg-d																										
Groundwater	Tap Water	Ingestion of tap water		POE concentration	C <sub>w</sub>	ug/l		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				POE concentration	C <sub>w</sub>	mg/m3		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				Water ingestion rate	IR	l/d	1																					
				Exposure frequency	EF	d/y	350																					
				Exposure duration	ED	y	6																					
				Body weight	BW	kg	15																					
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		5.07942E-07	5.81342E-07	6.6926E-05	4.15342E-05	0.000222082	1.02175E-06	5.4611E-07	0.000180712	0.000214959	1.05786E-06	4.1751E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	8.81096E-07	5.10877E-07	6.16575E-07			
				Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	6.80E-01	6.70E+00	4.50E-01					4.00E-01	4.00E-01	4.00E-01		
				Risk	R	fraction		1.01E-07	3.31E-08				9.30E-08	3.71E-08	5.16E-06	1.16E-08	2.84E-06	9.77E-06				7.33E-07	3.52E-07	2.04E-07	2.47E-07			
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
				Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.919E-06	6.78233E-06	0.000780804	0.000484566	0.002590959	1.19205E-05	6.37128E-06	0.002108311	0.002507854	1.23417E-05	4.87095E-05	1.70046E-05	0.000226685	1.90163E-05	1.22158E-05	1.02795E-05	5.94023E-06	7.1938E-06			
Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05									
Hazard Quotient	HQ	mg/kg-d		9.86499E-05	0.001695582	0.007808037	0.048456621	0.25909589	0.000596023	0.005792071	0.070277017	0.083595129	0.123417352	0.024354726	0.017004566	0.045336986		0.122157991	0.146849315									
Total Hazard Index	HI	mg/kg-d																										
		Dermal contact with tap water		POE concentration	C <sub>w</sub>	ug/l		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				event duration	t <sub>event</sub>	hr	1																					
				absorbed dose per event	D <sub>abs</sub>	mg/cm2-event		1.71293E-09	1.45785E-09	1.44936E-07	1.01602E-07	7.82499E-06	1.3784E-09	1.44735E-09	4.44855E-06	3.83727E-06	2.15732E-08	6.90925E-09	0	5.85864E-08	1.76154E-08	1.92059E-09	0	3.9849E-08	4.80936E-08			
				Event frequency	EV	events/day	1																					
				Exposure duration	ED	y	6																					
				Exposure frequency	EF	d/y	350																					
				Skin surface area	SA	cm2	6,600																					
				Body weight	BW	kg	15																					
				Averaging time	AT	d/y	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		6.19469E-08	5.27224E-08	5.24152E-06	3.67439E-06	0.000282986	4.9849E-08	5.23424E-08	0.000160879	0.000138773	7.80182E-07	2.49869E-07	0	2.11874E-06	6.37049E-07	6.9457E-08	0	1.44112E-06	1.73928E-06			
				Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	8.00E-01	6.70E+00	4.50E-01				4.00E-01	4.00E-01	4.00E-01			
				Risk	R	fraction		1.24E-08	3.01E-09				4.54E-09	3.56E-09	3.33E-06	8.58E-09	2.00E-07	0.00E+00				2.87E-07	0.00E+00	5.76E-07	6.96E-07			
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																										
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		7.22714E-07	6.15094E-07	6.1151E-05	4.28679E-05	0.003301501	5.81572E-07	6.10661E-07	0.001876922	0.001619014	9.10213E-06	2.91513E-06	0	2.47186E-05	7.43224E-06	8.10332E-07	0	1.6813E-05	2.02916E-05							
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05									
Hazard Quotient	HQ	mg/kg-d		1.20452E-05	0.000153774	0.00061151	0.004286789	0.330150105	2.90786E-05	0.000555147	0.062564068	0.05396714	0.091021282	0.001457567	0	0.004943729		0.008103318	0									
Total Hazard Index	HI	mg/kg-d																										
Air	Indoor Air	Vapors from tap water		Concentration in tap water	C <sub>w</sub>	ug/l		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				Concentration in tap water	C <sub>w</sub>	mg/m3		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				Volatilization factor	VF	dimensionless	0.0005 y																					
				POE concentration	C <sub>g-a</sub>	mg/m3		0.000046295	5.30475E-05	0.006107	0.00379	0.020265	0.000093335	4.98325E-05	0.01649	0.019615	0	0	0	0.001773	0	0	0.0000804	0	0			
				Inhalation rate	IR	m3/hr	0.42																					



TABLE 7-17  
RAE RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	Di(2-Chloroethyl) Ether	Di(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-08	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06	0.00E+00	2.19E-05	2.75E-04
	POE concentration	C <sub>air</sub>	mg/m3	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09	0.00E+00	2.19E-08	2.75E-07
	Inhalation rate	IR	m3/hr																								
	Exposure time	ET	h/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11	0	1.2096E-09	1.5189E-08
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01			7.70E-02	1.61E+00	3.08E-01		
Risk	R	fraction	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00			3.18E-12	1.07E-10	0.00E+00		
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																									
Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	0	1.4112E-08	1.77205E-07	
Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d					8.57E-03																				8.57E-04
Hazard Quotient	HQ	mg/kg-d					0.000163164										0.057615471										0.000206774
Total Hazard Index	HI	mg/kg-d																									
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	8.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	POE concentration	C <sub>w</sub>	mg/m3	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	8.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	Water Ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	3.52329E-07	2.29014E-07	3.87562E-07	1.58548E-05	0.000221041	2.50153E-06	2.32537E-06	4.30077E-06	2.47781E-06	2.11397E-05	3.06526E-06	0.000422795	8.80822E-06	4.5337E-07	0.007403178	7.22274E-07	4.58027E-06	2.30082E-06	2.90671E-06	2.62485E-06	2.60723E-06	2.47781E-06	1.55452E-06	1.87825E-05
	Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01			8.40E-02		7.30E+00			7.80E-02	1.60E+00	7.30E-01	
Risk	R	fraction	1.41E-07	9.16E-08	1.55E-07	6.34E-06	1.22E-05	1.83E-06	1.70E-05	3.14E-06	1.81E-07	2.33E-05		5.92E-06	5.46E-07	5.89E-08			6.07E-08	1.68E-05			2.05E-07	4.17E-06	1.81E-06		
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																									
Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	4.1105E-06	2.67183E-06	4.52155E-06	0.000184973	0.002578813	2.91846E-05	2.71293E-05	5.01756E-05	2.89078E-05	0.00024663	3.57614E-05	0.004932603	0.000102763	5.28932E-06	0.084370411	8.42683E-06	0.000534365	2.68429E-05	3.39116E-05	3.06232E-05	3.04177E-05	2.89078E-05	1.81361E-05	0.000219129	
Ingestion Reference Dose	RD <sub>ing</sub>	mg/kg-d					4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02								
Hazard Quotient	HQ	mg/kg-d			0.226077626		0.644703196						0.000894034	0.246630137	0.005138128	0.007556164	4.318520548	0.000421326	0.05343653	0.008477911	0.15311621	0.038022146			0.004534018	0.010956438	
Total Hazard Index	HI	mg/kg-d																									
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	8.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	event duration	t <sub>event</sub>	hr																								
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	2.10327E-07	1.46655E-07	3.93971E-07	0.000100654	9.38632E-07	8.44979E-07	1.34667E-06	2.52742E-06	1.43532E-06	1.55725E-06	7.91863E-08	1.73515E-05	1.92954E-08	3.28754E-09	7.11354E-05	1.47044E-09	1.11247E-07	2.06933E-06	1.39311E-07	1.6942E-07	3.2467E-07	1.51745E-06	0	3.29882E-07
	Event frequency	EV	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								



TABLE 7-17  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern						Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour Intrusion - Inhalation	POE concentration	$C_{\text{air}}$	ug/m3	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	$C_{\text{air}}$	mg/m3	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_{nc}$	d								
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08		
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg				2.10E+00	4.00E-01	3.00E-02		
	Risk	R	fraction				1.52E-07	5.52E-07	1.55E-09		
	Total carcinogenic risk for exposure route	$R_i$	fraction							7.94E-07	0%
	Average Intake from Inhalation non-carcinogens	$I_{nc}$	mg/kg-d	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07		
Ingestion of tap water	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.86E-02		
	Hazard Quotient	HQ	mg/kg-d	7.76292E-06			6.02959E-06	0.001413122	2.10889E-05		
	Total Hazard Index	HI	mg/kg-d							6.35E-06	0%
	POE concentration	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	POE concentration	$C_w$	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
Ingestion of tap water	Water Ingestion rate	IR	l/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_{nc}$	d								
	Average Intake from Ingestion carcinogens	$I_c$	mg/kg-d	2.02937E-06	2.85386E-05	1.59253E-05	2.36712E-05	6.35616E-05	0.000001286		
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg		7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01		
	Risk	R	fraction		2.00E-04	1.91E-06	1.28E-05	2.54E-05	9.26E-07		
	Total carcinogenic risk for exposure route	$R_i$	fraction							3.54E-04	11%
	Average Intake from Ingestion non-carcinogens	$I_{nc}$	mg/kg-d	2.3676E-05	0.000332951	0.000185795	0.000276164	0.000741553	1.50033E-05		
	Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.047351963		0.006193157	0.027616438	2.471841705	0.005901111		
	Total Hazard Index	HI	mg/kg-d							6.35E-06	13%
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	event duration	$t_{\text{event}}$	hr								
	absorbed dose per event	$D_{\text{aevent}}$	mg/cm2-event	3.98612E-09	2.54173E-08	5.14528E-06	3.8E-07	2.84437E-07	1.92945E-09		
	Event frequency	EV	events/day								
	Exposure duration	ED	y								
	Exposure frequency	EF	d/y								
	Skin surface area	SA	cm2								
	Body weight	BW	kg								
	Averaging time	AT	d/y								
	Averaging time non-carcinogens	$AT_{nc}$	d								
	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	1.44156E-07	9.192E-07	0.000186076	1.37425E-05	1.02865E-05	6.97772E-08		
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01		
	Risk	R	fraction		1.65E-06	2.23E-05	7.42E-06	6.17E-07	5.02E-08		
	Total carcinogenic risk for exposure route	$R_i$	fraction							2.22E-03	69%
Dermal contact with tap water	Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d	1.68181E-06	1.0724E-05	0.002170887	0.000160329	0.000120009	8.14068E-07		
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.003363629		0.072362894	0.016032862	2.666864567	0.000271356		
	Total Hazard Index	HI	mg/kg-d							1.31E+03	28%
Vapors from tap water	Concentration in tap water	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Concentration in tap water	$C_w$	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Volatilization factor	VF	dimensionless y								
	POE concentration	$C_{\text{air, vap}}$	mg/m3	0.00018518	0	0	0.00216	0.0058	0.000117348		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_{nc}$	d								
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d	1.0228E-05	0	0	0.000119303	0.000320351	6.48144E-06		
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg				2.10E+00	4.00E-01	3.00E-02		
	Risk	R	fraction				2.61E-04	1.28E-04	1.94E-07		
	Total carcinogenic risk for exposure route	$R_i$	fraction							6.48E-06	20%



TABLE 7-17  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

Chemicals of Potential Concern																													
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Acroter-1016	Acroter-121	Acroter-1232				
Surface Water	Creek	Incidental ingestion of creek water	Average intake from inhalation non-carcinogens	$I_{inh}$	mg/kg-d			2.98317E-05	3.41829E-05	0.00393525	0.002442214	0.013058433	6.00791E-05	3.21112E-05	0.010625885	0.012639584	0	0	0	0.001142492	0	0	5.18084E-05	0	0				
			Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d								1.14E-03	1.40E-03	1.14E-03		2.30E-01												
			Hazard Quotient	HQ	mg/kg-d								11.45476568	0.042913644	0.028167758		0.054954711												
			Total Hazard Index	HI	mg/kg-d																								
			POE concentration	$C_{POE}$	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07				
			POE concentration	$C_{POE}$	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07				
			Water ingestion rate	IR	l/d	0.05																							
			Exposure frequency	EF	d/y	52																							
			Exposure duration	ED	y	6																							
			Body weight	BW	kg	15																							
Averaging time carcinogens	$AT_c$	d	25,550																										
Averaging time non-carcinogens	$AT_{nc}$	d	2,190																										
			Average intake from ingestion carcinogens	$I_{ing}$	mg/kg-d			1.57584E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35444E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	6.04284E-12	3.2523E-12	1.74052E-14	1.00943E-14	1.21827E-14				
			Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	4.00E-01				
			Risk	R	fraction			3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15	4.87E-15				
			Total carcinogenic risk for exposure route	$R_i$	fraction																								
			Average intake from ingestion non-carcinogens	$I_{ing}$	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22426E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13	1.42132E-13				
			Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05							
			Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09						
			Total Hazard Index	HI	mg/kg-d																								
					Dermal contact with creek water	POE concentration	$C_{POE}$	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07	
						event duration	$t_{event}$	hr	2																				
absorbed dose per event	$D_{abs}$	mg/cm2-event						1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13	1.80907E-13				
Event frequency	EF	events/day				1																							
Exposure duration	ED	y				6																							
Exposure frequency	EF	d/y				52																							
Skin surface area	SA	cm2				6,600																							
Body weight	BW	kg				15																							
Averaging time	AT	d/y				25,550																							
Averaging time non-carcinogens	$AT_{nc}$	d				2,190																							
			Absorbed dose for carcinogens	$DAD_{car}$	mg/kg-d			5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10204E-12	0	8.05383E-13	9.72014E-13				
			Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	4.00E-01				
			Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	3.89E-13				
			Total carcinogenic risk for exposure route	$R_i$	fraction																								
			Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12	1.13402E-11				
			Dermal Reference Dose	$RfD_{der}$	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05						
			Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0						
			Total Hazard Index	HI	mg/kg-d																								
			Carcinogenic risk - all routes (detected organics)																										
			Carcinogenic risk - all routes (undetected organics)																										
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction			6.33E-07	2.03E-07	0.00E+00	0.00E+00	0.00E+00	5.67E-07	4.07E-08	0.00E+00	3.23E-05	2.02E-08	3.04E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	2.13E-06	7.81E-07	9.42E-07				
Non-Carcinogenic risk - all routes (detected organics)																													
Non-Carcinogenic risk - all routes (undetected organics)																													
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction			0.000110697	0.00184942	0.00841963	0.052773483	12.04632955	0.043627133	0.034575128	0.132958229	0.192637715	0.214447013	0.023812968	0.017004619	0.050281315	0	0.1302624	0.146849318	0	0				

Notes  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilogram per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-17  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

			Chemicals of Potential Concern																										
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene		
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	2.07169E-05	0	2.27886E-05	0.000932262	0.012997216	0	0	0.000252885	0	0.001243016	0	0	0.000517923	2.66581E-05	0.435306871	4.24697E-05	0.002693201	0	0.000170915	0.000154341	0.000153305	0	9.14058E-05	0.001104409		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d					8.57E-03										1.70E-02									8.57E-04		
	Hazard Quotient	HQ	mg/kg-d					1.516594684										25.60628654									1.288691933		
	Total Hazard Index	HI	mg/kg-d																										
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	POE concentration	C <sub>w</sub>	mg/m3	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	Water Ingestion rate	IR	l/d																										
	Exposure frequency	EF	d/y																										
	Exposure duration	ED	y																										
	Body weight	BW	kg																										
	Averaging time carcinogens	AT <sub>c</sub>	d																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.04082E-11	1.40821E-12	5.53403E-08	7.43004E-12	4.71175E-10	1.99009E-16	6.74329E-14	5.18437E-14	1.63079E-13	2.14317E-16	4.82755E-12	5.83402E-11		
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00	1.40E-02	1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00	8.40E-02	7.30E+00	1.45E-15	7.80E-02	1.60E+00	7.30E-01	7.30E-01	7.30E-01		
Risk	R	fraction	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13											
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																											
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.6371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.4641E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	2.50037E-15	5.63215E-11	6.80636E-10		
	Ingestion Reference Dose	RfD <sub>inh</sub>	mg/kg-d				2.00E-05	4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02		
	Hazard Quotient	HQ	mg/kg-d				4.467E-09	4.33179E-07						9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09		1.40804E-08	3.40318E-08		
	Total Hazard Index	HI	mg/kg-d																										
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	event duration	t <sub>event</sub>	hr																										
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event																										
	Event frequency	EF	events/day																										
	Exposure duration	ED	y																										
	Exposure frequency	EF	d/y																										
	Skin surface area	SA	cm2																										
	Body weight	BW	kg																										
	Averaging time	AT	d/y																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50488E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	1.34255E-13	0	1.07639E-09		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00	1.40E-02	1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00	8.40E-02	7.30E+00	1.34E-12	7.80E-02	1.60E+00	2.30E-01				
	Risk	R	fraction	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		6.24E-13										
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																										
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	1.5663E-12	0	1.25579E-08		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05	4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02		
	Hazard Quotient	HQ	mg/kg-d				4.64479E-06	2.19966E-06						2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07		0	6.27894E-07		
	Total Hazard Index	HI	mg/kg-d																										
Carcinogenic risk - all routes (detected organics)																													
Carcinogenic risk - all routes (undetected organics)																													
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	3.89E-06	2.21E-06	6.64E-06	1.49E-03	4.44E-05	9.01E-06	1.31E-04	1.19E-05	3.97E-06	1.47E-04	0.00E+00	1.47E-05	5.89E-07	1.93E-07	0.00E+00	6.51E-08	1.87E-05	5.63E-04	0.00E+00	1.70E-06	4.41E-05	1.44E-05	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																													
Non-Carcinogenic risk - all routes (undetected organics)																													
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	8.537250358	0	2.260469962	0	0	0	0	0.001729539	2.173180576	0.005543353	0.009537899	34.82439968	0.00045236	0.076913003	0	0.023172374	0.510945735	0.209252755	0	0.004534032	1.306814953	



TABLE 7-17  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

		Chemicals of Potential Concern							Total	Rf Contribution
Exposure Route	Parameter	Symbol	Units	Chlorobenzene	1,1-Dichloro-2,2-diphenylethane	Pentachlorophenol	Tetrachloroethene	Trichloroethene		
Incidental ingestion of creek water	Average Intake from Inhalation non-carcinogens	$I_{inh}$	mg/kg-d	0.000119327	0	0	0.001391868	0.003737425	7.56168E-05	
	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.86E-02	
	Hazard Quotient	HQ	mg/kg-d	0.208978893			0.009941918	0.327844268	0.002643944	
	Total Hazard Index	HI	mg/kg-d						0.339467009	59%
	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	POE concentration	$C_w$	mg/m3	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	Water ingestion rate	IR	l/d							
	Exposure frequency	EF	d/y							
	Exposure duration	ED	y							
	Body weight	BW	kg							
Incidental ingestion of creek water	Averaging time carcinogens	$AT_c$	d							
	Averaging time non-carcinogens	$AT_n$	d							
	Average Intake from Ingestion carcinogens	$I_{ing}$	mg/kg-d	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11	
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg		7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01	
	Risk	R	fraction		2.06E-09	3.78E-14	1.85E-11	4.78E-10	9.52E-12	
	Total carcinogenic risk for exposure route	$R_i$	fraction						8.25E-09	0%
	Average Intake from Ingestion non-carcinogens	$I_{ing}$	mg/kg-d	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10	
	Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d	5.00E-04	3.00E-02	3.00E-02	1.00E-02	3.00E-04	3.00E-03	
	Hazard Quotient	HQ	mg/kg-d	1.4708E-07	1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08		
	Total Hazard Index	HI	mg/kg-d						9.72E-08	0%
Dermal contact with creek water	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	event duration	event	hr							
	absorbed dose per event	$D_{event}$	mg/cm2-event	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12	
	Event frequency	EF	events/day							
	Exposure duration	ED	y							
	Exposure frequency	EF	d/y							
	Skin surface area	SA	cm2							
	Body weight	BW	kg							
	Averaging time	AT	d/y							
	Averaging time non-carcinogens	$AT_n$	d							
Dermal contact with creek water	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	1.35762E-11	2.83647E-10	1.09991E-10	5.62195E-10	5.73079E-09	2.3968E-11	
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01	
	Risk	R	fraction		5.11E-10	1.25E-11	3.04E-10	3.44E-10	1.73E-11	
	Total carcinogenic risk for exposure route	$R_i$	fraction						8.51E-09	0%
	Absorbed dose for non-carcinogens	$DAD_n$	mg/kg-d	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10	
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d	5.00E-04	3.00E-02	3.00E-02	1.00E-02	4.50E-05	3.00E-03	
	Hazard Quotient	HQ	mg/kg-d	3.16778E-07	4.04408E-08	6.55894E-07	0.001485759	9.32089E-08		
	Total Hazard Index	HI	mg/kg-d						2.84E-06	0%
	Carcinogenic risk - all routes (detected organics)								2.38E-03	
	Carcinogenic risk - all routes (undetected organics)								8.25E-04	
TOTAL CARCINOGENIC RISK - ALL ROUTES		Sum Ri	fraction	0.00E+00	2.01E-04	2.42E-05	2.71E-04	1.55E-04	1.17E-06	3.22E-03
Non-Carcinogenic risk - all routes (detected organics)									5.87E+01	
Non-Carcinogenic risk - all routes (undetected organics)									1.01E+01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES		Sum HI	fraction	0.259702702	0	0.078556091	0.053597943	5.469495859	0.007937645	6.89E+01

TCE slope factor



TABLE 7-18

**RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL B)**  
**MISSOURI ELECTRIC WORKS**

							Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4-chloro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1232			
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>inh</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	0.00E+00			
				POE concentration	C <sub>inh</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	0.00E+00			
				Inhalation rate	IR	m3/hr	0.42																					
				Exposure time	ET	h/d	24																					
				Exposure frequency	EF	d/y	350																					
				Exposure duration	ED	y	6																					
				Body weight	BW	kg	15																					
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13466E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.04047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	0			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02											
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00											
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
				Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	0			
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01												
Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05																
Total Hazard Index	HI	mg/kg-d																										
Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l			0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			POE concentration	C <sub>w</sub>	mg/m3		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525				
			Water Ingestion rate	IR	l/d	1																						
			Exposure frequency	EF	d/y	350																						
			Exposure duration	ED	y	6																						
			Body weight	BW	kg	15																						
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																						
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
			Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		5.07342E-07	5.81342E-07	6.6924E-05	4.15342E-05	0.000222082	1.02175E-06	5.4611E-07	0.000180712	0.000214959	1.05784E-06	4.1751E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	8.81094E-07	5.10877E-07	6.16575E-07				
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00	4.50E-01		4.50E-01	4.00E-01	4.00E-01	4.00E-01				
			Risk	R	fraction		1.01E-07	3.31E-08				9.30E-08	3.71E-08		5.16E-06	1.16E-08	2.84E-06	9.77E-06	7.33E-07		3.52E-07	2.04E-07	2.47E-07					
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
			Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.919E-06	6.78233E-06	0.000780804	0.000484566	0.002590959	1.19205E-05	6.37128E-06	0.002108311	0.002507854	1.23417E-05	4.87095E-05	1.70046E-05	0.000226685	1.90163E-05	1.22158E-05	1.02795E-05	5.96022E-06	7.19338E-06				
			Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05							
			Hazard Quotient	HQ	mg/kg-d		9.86499E-05	0.001695582	0.007808037	0.048456621	0.25909589	0.000596023	0.005792071	0.070277017	0.083395129	0.123417352	0.024354726	0.017004566	0.045336986		0.122157991	0.146849315						
Total Hazard Index	HI	mg/kg-d																										
		Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l			0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			event duration	D <sub>event</sub>	hr	1																						
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1																						
			Event frequency	EF	events/day	1																						
			Exposure duration	ED	y	6																						
			Exposure frequency	EF	d/y	350																						
			Skin surface area	SA	cm2	6,600																						
			Body weight	BW	kg	15																						
			Averaging time	AT	d/y	25,550																						
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
			Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d		6.19469E-08	5.27224E-08	5.24152E-06	3.67439E-06	0.000282986	4.9849E-08	5.23424E-08	0.000160879	0.000138773	7.80182E-07	2.49849E-07	0	2.11874E-06	6.37049E-07	6.9457E-08	0	1.44112E-06	1.73928E-06				
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00	4.50E-01		4.50E-01	4.00E-01	4.00E-01					
			Risk	R	fraction		1.24E-08	3.01E-09				4.54E-09	3.56E-09		3.33E-06	8.98E-09	2.00E-07	0.00E+00	2.87E-07		0.00E+00	5.76E-07	6.94E-07					
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		7.22714E-07	6.15094E-07	6.1151E-05	4.28679E-05	0.003301501	5.81572E-07	6.10641E-07	0.001876922	0.001619014	9.10213E-06	2.91513E-06	0	2.47186E-05	7.43224E-06	8.10332E-07	0	1.6813E-05	2.02916E-05				
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05										
Hazard Quotient	HQ	mg/kg-d		1.20452E-05	0.000153774	0.00061151	0.004286789	0.330150105	2.90786E-05	0.000555147	0.062564058	0.05396714	0.091021282	0.001457567	0	0.004943729		0.008103318	0									
Total Hazard Index	HI	mg/kg-d																										
(only calculated for COPC with Henry's Law > 1e-5 atm.m3/mol. those with a "Y")	Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				Concentration in tap water	C <sub>w</sub>	mg/m3		0.09259	0.106095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
				Volatilization factor	VF	dimensionless	0.0005 Y																					
				POE concentration	C <sub>inh</sub>	mg/m3	0.000046295 Y	5.30475E-05 Y	0.006107 Y	0.00379 Y	0.020265 Y	0.000093235 Y	4.98325E-05 Y	0.01649 Y	0.019615 Y	0	0	0	0.001773 Y	0	0	0.0000804 Y	0	0				
				Inhalation rate	IR	m3/hr	0.42																					
				Exposure time	ET	h/d	24																					
				Exposure frequency	EF	d/y	350																					
				Exposure duration	ED	y	6																					
				Body weight	BW	kg	15																					
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		2.55701E-06	2.92997E-06	0.000337307	0.000209333	0.001119294	5.14964E-06	2.75239E-06	0.00091079	0.001083393	0	0	0	9.79279E-05	0	0	4.44072E-06	0	0			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02											
				Risk	R	fraction		5.19E-07	1.67E-07				4.69E-07			2.38E-05	0.00E+00											
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						



TABLE 7-18  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl) phthalate	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylanthracene	Naphthalene
Vapour Intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	3.48E-08	0.00E+00	5.00E-08	2.08E-04	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06	0.00E+00	2.19E-05	2.75E-04
	POE concentration	C <sub>POE</sub>	mg/m3	3.48E-11	0.00E+00	5.00E-11	2.08E-07	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09	0.00E+00	2.19E-08	2.75E-07
	Inhalation rate	IR	m3/hr																								
	Exposure time	ET	h/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>n</sub>	d																								
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11	0	1.2096E-09	1.5189E-08
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01			
Risk	R <sub>i</sub>	fraction	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10	0.00E+00			
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																									
Average intake from inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	0	1.4112E-08	1.77205E-07	
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d					8.57E-03										1.70E-02									8.57E-04	
Hazard Quotient	HQ	mg/kg-d					0.000163164										0.057615471									0.000206774	
Total Hazard Index	HI	mg/kg-d																									
Ingestion of tap water	POE concentration	C <sub>POE</sub>	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	POE concentration	C <sub>POE</sub>	mg/m3	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	Water ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>n</sub>	d																								
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	3.52329E-07	2.29014E-07	3.87562E-07	1.58548E-05	0.000221041	2.50153E-06	2.32537E-06	4.30077E-06	2.47781E-06	2.11397E-05	3.04526E-06	0.000422795	8.80822E-06	4.5337E-07	0.007403178	7.22274E-07	4.58027E-05	2.30082E-06	2.90671E-06	2.62485E-06	2.60723E-06	2.47781E-06	1.55452E-06	1.87825E-05
	Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	7.30E-01		
Risk	R <sub>i</sub>	fraction	1.41E-07	9.16E-08	1.55E-07	6.34E-06	1.22E-05	1.63E-06	1.70E-05	3.14E-06	1.81E-07	2.33E-05		5.92E-06	5.46E-07	5.89E-08		6.07E-08		1.68E-05		2.05E-07	4.17E-06	1.81E-06			
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																									
Average intake from ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d	4.1105E-06	2.67183E-06	4.52155E-06	0.000184973	0.002578813	2.91846E-05	2.71293E-05	5.01756E-05	2.89078E-05	0.00024463	3.57614E-05	0.004932603	0.000102763	5.28932E-06	0.086370411	8.42653E-06	0.000534365	2.68429E-05	3.39116E-05	3.06232E-05	3.04177E-05	2.89078E-05	1.81361E-05	0.000219129	
Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d			2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04		4.00E-03	2.00E-02	
Hazard Quotient	HQ	mg/kg-d			0.226077626		0.644703196						0.000894034	0.246630137	0.005138128	0.007556164	4.318520548	0.000421326	0.05343653		0.008477911	0.15311621	0.038022146		0.004534018	0.010956438	
Total Hazard Index	HI	mg/kg-d																									
Dermal contact with tap water	POE concentration	C <sub>POE</sub>	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	event duration	C <sub>POE</sub>	hr																								
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.10327E-07	1.46655E-07	3.93971E-07	0.000100654	9.38632E-07	8.44979E-07	1.34667E-06	2.52742E-06	1.43532E-06	1.55725E-08	7.91863E-08	1.73515E-05	1.92954E-08	3.28754E-09	7.11354E-05	1.47044E-09	1.11247E-07	2.06933E-06	1.39311E-07	1.6962E-07	3.2467E-07	1.51745E-06	0	3.29882E-07
	Event frequency	EV	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								



TABLE 7-18  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern						Total	R Contribution
Exposure Route	Parameter	Symbol	Units	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour Intrusion - Inhalation	POE concentration	$C_{air}$	ug/m3	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	$C_{air}$	mg/m3	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_n$	d								
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08		
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg				2.10E+00	2.00E-02	3.00E-02		
	Risk	R	fraction				1.52E-07	2.76E-08	1.55E-09		
	Total carcinogenic risk for exposure route	$R_t$	fraction							2.76E-07	0%
	Average Intake from Inhalation non-carcinogens	$I_n$	mg/kg-d	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07		
	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.86E-02		
	Hazard Quotient	HQ	mg/kg-d	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05		
	Total Hazard Index	HI	mg/kg-d							6.18E-06	0%
Ingestion of tap water	POE concentration	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	POE concentration	$C_w$	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Water ingestion rate	IR	l/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_n$	d								
	Average Intake from Ingestion carcinogens	$I_c$	mg/kg-d	2.02937E-06	2.85386E-05	1.59253E-05	2.36712E-05	6.35616E-05	0.000001286		
	Ingestion Cancer Slope Factor	$CSF_o$	kg-d/mg		7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01		
	Risk	R	fraction		2.00E-04	1.91E-06	1.28E-05	1.27E-06	9.26E-07		
	Total carcinogenic risk for exposure route	$R_t$	fraction							3.30E-06	11%
	Average Intake from Ingestion non-carcinogens	$I_n$	mg/kg-d	2.3676E-05	0.000332951	0.000185795	0.000276164	0.000741553	1.50033E-05		
	Ingestion Reference Dose	$RfD_o$	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.047351963		0.006193157	0.027616438	2.471841705	0.005001111		
	Total Hazard Index	HI	mg/kg-d							9.38E-06	13%
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	event duration	event	hr								
	absorbed dose per event	$D_{aevent}$	mg/cm2-event	3.98612E-09	2.54173E-08	5.14528E-06	3.8E-07	2.84437E-07	1.92945E-09		
	Event frequency	EF	events/day								
	Exposure duration	ED	y								
	Exposure frequency	EF	d/y								
	Skin surface area	SA	cm2								
	Body weight	BW	kg								
	Averaging time	AT	d/y								
	Averaging time non-carcinogens	$AT_n$	d								
	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	1.44156E-07	9.192E-07	0.000186076	1.37425E-05	1.02865E-05	6.97772E-08		
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01		
	Risk	R	fraction		1.65E-06	2.23E-05	7.42E-06	3.09E-08	5.02E-08		
	Total carcinogenic risk for exposure route	$R_t$	fraction							2.22E-08	72%
	Absorbed dose for non-carcinogens	$DAD_n$	mg/kg-d	1.68181E-06	1.0724E-05	0.002170887	0.000160329	0.000120009	8.14068E-07		
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.003363629		0.072362894	0.016032862	2.666864567	0.000271356		
	Total Hazard Index	HI	mg/kg-d							1.91E+01	28%
Vapors from tap water  (mol, those with a "y")	Concentration in tap water	$C_w$	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Concentration in tap water	$C_w$	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Volatilization factor	VF	dimensionless y				y	y	y		
	POE concentration	$C_{air-vap}$	mg/m3	0.00018518	0	0	0.00216	0.0058	0.000117348		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	$AT_c$	d								
	Averaging time non-carcinogens	$AT_n$	d								
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d	1.0228E-05	0	0	0.000119303	0.000320351	6.48144E-06		
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg				2.10E+00	2.00E-02	3.00E-02		
	Risk	R	fraction				2.51E-04	6.41E-06	1.94E-07		
	Total carcinogenic risk for exposure route	$R_t$	fraction							6.19E-06	17%



TABLE 7-18  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

Chemicals of Potential Concern																										
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Acetone-1016	Acetone-1221	Acetone-1232	
Surface Water	Creek	Incidental Ingestion of creek water	Average Intake from Inhalation non-carcinogens	$I_{inh}$	mg/kg-d			2.98317E-05	3.41829E-05	0.00393525	0.002442214	0.013058433	6.00791E-05	3.211112E-05	0.010625885	0.012639584	0	0	0	0.001142492	0	0	5.18084E-05	0	0	
			Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d									1.14E-03	1.40E-03	1.14E-03		2.30E-01								
			Hazard Quotient	HQ	mg/kg-d									11.45476568	0.042913644	0.028167758		0.054954711								
			Total Hazard Index	HI	mg/kg-d																					
			POE concentration	$C_w$	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07	
			POE concentration	$C_w$	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07	
			Water Ingestion rate	IR	l/d	0.05																				
			Exposure frequency	EF	d/y	52																				
			Exposure duration	ED	y	6																				
			Body weight	BW	kg	15																				
			Averaging time carcinogens	$AT_c$	d	25,550																				
			Averaging time non-carcinogens	$AT_{nc}$	d	2,190																				
			Average Intake from Ingestion carcinogens	$I_i$	mg/kg-d			1.57584E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14	1.21827E-14	
			Ingestion Cancer Slope Factor	$CSF_o$	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	6.80E-01	6.70E+00	4.50E-01	4.50E-01	4.50E-01	4.50E-01	4.00E-01	4.00E-01	4.00E-01	
			Risk	R	fraction			3.15E-13	3.41E-13				9.54E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15	4.87E-15	
			Total carcinogenic risk for exposure route	$R_i$	fraction																					
Average Intake from Ingestion non-carcinogens	$I_i$	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13	1.42132E-13				
Ingestion Reference Dose	$RfD_o$	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05							
Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09						
Total Hazard Index	HI	mg/kg-d																								
		Dermal contact with creek water	POE concentration	$C_w$	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07	
			event duration	$t_{event}$	hr	2																				
			absorbed dose per event	$D_{aevent}$	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27548E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13549E-12	0	1.49895E-13	1.80907E-13	
			Event frequency	EF	events/day	1																				
			Exposure duration	ED	y	6																				
			Exposure frequency	EF	d/y	52																				
			Skin surface area	SA	cm2	6,600																				
			Body weight	BW	kg	15																				
			Averaging time	AT	d/y	25,550																				
			Averaging time non-carcinogens	$AT_{nc}$	d	2,190																				
			Absorbed dose for carcinogens	$DAD_o$	mg/kg-d			5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13	9.72014E-13	
			Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	6.80E-01	6.70E+00	4.50E-01	4.50E-01	4.50E-01	4.50E-01	4.00E-01	4.00E-01	4.00E-01	
			Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	3.89E-13	
			Total carcinogenic risk for exposure route	$R_i$	fraction																					
			Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38294E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12	1.13402E-11	
			Dermal Reference Dose	$RfD_{der}$	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0						
Total Hazard Index	HI	mg/kg-d																								
Carcinogenic risk - all routes (detected organics)																										
Carcinogenic risk - all routes (undetected organics)																										
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction			6.33E-07	2.03E-07	0.00E+00	0.00E+00	0.00E+00	5.67E-07	4.07E-08	0.00E+00	3.23E-05	2.02E-08	3.04E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	2.13E-06	7.81E-07	9.42E-07	
Non-Carcinogenic risk - all routes (detected organics)																										
Non-Carcinogenic risk - all routes (undetected organics)																										
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction			0.000110897	0.00184942	0.00841963	0.052773483	1.204632955	0.043627133	0.034575128	0.132958229	0.192637715	0.214447013	0.025812968	0.017004619	0.050281315	0	0.1302624	0.146849318	0		

Notes:  
1 ug/l = micrograms per liter  
2 ug/m3 = micrograms per cubic meter  
3-h/d = hours per day  
4 l/d = liters per day  
5-d/y = days per year  
6-y = year  
7-kg = kilogram  
8-d = day  
9-hr = hour  
10-mg/kg-d = milligrams per kilogram per day  
11-kg-d/mg = kilograms per day per milligram  
12-cm2 = square centimeter  
13-m3/hr = cubic meter per hour  
14-mg/m3 = milligrams per cubic meter  
15-mg/cm2-event = milligrams per square centimeter per event  
16-mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-18  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL 9)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																									
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-butadiene	Hexachlorobenzene	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene		
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	2.07169E-05	0	2.27886E-05	0.000932262	0.012997216	0	0	0.000252885	0	0.001243016	0	0	0.000517923	2.66581E-05	0.435306871	4.24697E-05	0.002693201	0	0.000170915	0.000154341	0.000153305	0	9.14058E-05	0.001104409		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d					8.57E-03										1.70E-02								0	8.57E-04		
	Hazard Quotient	HQ	mg/kg-d					1.516594684										25.60628654								0	1.288691933		
	Total Hazard Index	HI	mg/kg-d																							0			
Incidental Ingestion of creek water	POE concentration	C <sub>pw</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	POE concentration	C <sub>pw</sub>	mg/m3	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	Water ingestion rate	IR	l/d																										
	Exposure frequency	EF	d/y																										
	Exposure duration	ED	y																										
	Body weight	BW	kg																										
	Averaging time carcinogens	AT <sub>c</sub>	d																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	6.96157E-15	4.52802E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13	2.14317E-16	4.82755E-12	5.83402E-11		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00			7.80E-02	1.60E+00	7.30E-01			
	Risk	R	fraction	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13		1.45E-15			4.05E-15	2.61E-13	1.56E-16			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																										
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.6841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	2.50037E-15	5.63215E-11	6.80636E-10		
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d				2.00E-05	4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	4.00E-03	2.00E-02			
	Hazard Quotient	HQ	mg/kg-d				4.667E-09	4.33179E-07					9.19697E-09	4.6731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09		1.40804E-08	3.40318E-08			
Total Hazard Index	HI	mg/kg-d																											
Dermal contact with creek water	POE concentration	C <sub>pw</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	event duration	t <sub>event</sub>	hr																										
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86409E-12	2.49869E-14	0	2.00333E-10		
	Event frequency	EF	events/day																										
	Exposure duration	ED	y																										
	Exposure frequency	EF	d/y																										
	Skin surface area	SA	cm2																										
	Body weight	BW	kg																										
	Averaging time	AT	d/y																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70646E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	1.34255E-13	0	1.07639E-09		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00			7.80E-02	1.60E+00	2.30E-01			
	Risk	R	fraction	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12			2.67E-13	3.32E-11	3.09E-14			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																										
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55844E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	1.5663E-12	0	1.25579E-08		
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05	4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04	4.00E-03	2.00E-02				
Hazard Quotient	HQ	mg/kg-d				4.64479E-06	2.13966E-06					2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07		4.00E-03	2.00E-02				
Total Hazard Index	HI	mg/kg-d																											
Carcinogenic risk - all routes (detected organics)																													
Carcinogenic risk - all routes (undetected organics)																													
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>c</sub>	fraction	3.89E-06	2.21E-06	6.64E-06	1.49E-03	4.44E-05	9.01E-06	1.31E-04	1.19E-05	3.97E-06	1.47E-04	0.00E+00	1.47E-05	5.89E-07	1.93E-07	0.00E+00	6.51E-08	1.87E-05	5.63E-04	0.00E+00	1.70E-06	4.41E-05	1.44E-05	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																													
Non-Carcinogenic risk - all routes (undetected organics)																													
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	8.537250338	0	2.240469962	0	0	0	0	0	0.001729539	2.173180576	0.005545353	0.009537899	34.82439998	0.00045236	0.076913003	0	0.023172374	0.510945735	0.269252755	0	0.004534032	1.306814953



TABLE 7-18  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

		Chemicals of Potential Concern							Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene		
Incidental ingestion of creek water	Average Intake from Inhalation non-carcinogens	$I_{inh}$	mg/kg-d	0.000119327	0	0	0.001391868	0.003737425	7.56168E-05	
	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.84E-02	
	Hazard Quotient	HQ	mg/kg-d	0.208978893			0.009941918	0.327844268	0.002643944	
	Total Hazard Index	HI	mg/kg-d						4.08E-01	59%
	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	POE concentration	$C_w$	mg/m3	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	Water ingestion rate	IR	l/d							
	Exposure frequency	EF	d/y							
	Exposure duration	ED	y							
	Body weight	BW	kg							
Incidental ingestion of creek water	Averaging time carcinogens	$AT_c$	d							
	Averaging time non-carcinogens	$AT_{nc}$	d							
	Average Intake from Ingestion carcinogens	$I_{ing}$	mg/kg-d	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11	
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg	7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01		
	Risk	R	fraction	2.06E-09	3.78E-14	1.85E-11	2.39E-11	9.52E-12		
	Total carcinogenic risk for exposure route	$R_i$	fraction						2.78E-08	0%
	Average Intake from Ingestion non-carcinogens	$I_{ing}$	mg/kg-d	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10	
	Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d	5.00E-04	3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	1.4708E-07	1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08		
	Total Hazard Index	HI	mg/kg-d						9.92E-08	0%
Dermal contact with creek water	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	event duration	$t_{event}$	hr							
	absorbed dose per event	$D_{aevent}$	mg/cm2-event	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12	
	Event frequency	EF	events/day							
	Exposure duration	ED	y							
	Exposure frequency	EF	d/y							
	Skin surface area	SA	cm2							
	Body weight	BW	kg							
	Averaging time	AT	d/y							
	Averaging time non-carcinogens	$AT_{nc}$	d							
Dermal contact with creek water	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	1.35762E-11	2.83647E-10	1.09991E-10	5.62195E-10	5.73079E-09	2.3968E-11	
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01	
	Risk	R	fraction		5.11E-10	1.25E-11	3.04E-10	1.72E-11	1.73E-11	
	Total carcinogenic risk for exposure route	$R_i$	fraction						8.18E-09	0%
	Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d	1.58389E-10	3.30921E-09	1.21322E-09	6.58894E-09	6.68592E-08	2.79627E-10	
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d	5.00E-04	3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	3.16778E-07		4.04408E-08	6.58894E-07	0.001485799	9.32089E-08	
	Total Hazard Index	HI	mg/kg-d						2.84E-03	0%
	Carcinogenic risk - all routes (detected organics)								2.23E-03	
	Carcinogenic risk - all routes (undetected organics)								8.25E-04	
TOTAL CARCINOGENIC RISK - ALL ROUTES		Sum Ri	fraction	0.00E+00	2.01E-04	2.42E-05	2.71E-04	7.74E-06	1.17E-06	3.07E-03
Non-Carcinogenic risk - all routes (detected organics)									5.87E+01	
Non-Carcinogenic risk - all routes (undetected organics)									1.01E+01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES		Sum HI	fraction	0.259702702	0	0.078556091	0.053597943	5.469495859	0.007937645	6.89E+01

TCE slope factor



TABLE 7-19

**RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)**  
**MISSOURI ELECTRIC WORKS**

							Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,2-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1222		
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>inh</sub>	ug/m3		7.59E-04	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	0.00E+00		
				POE concentration	C <sub>inh</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	0.00E+00		
				Inhalation rate	IR	m3/hr	0.42																				
				Exposure time	ET	h/d	24																				
				Exposure frequency	EF	d/y	350																				
				Exposure duration	ED	y	6																				
				Body weight	BW	kg	15																				
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																				
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13466E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.04047E-08	5.85448E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	0	0	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02							4.00E-01	4.00E-01	4.00E-01	
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00							1.49E-12	0.00E+00	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
				Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78135E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	0	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01											
Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05															
Total Hazard Index	HI	mg/kg-d																									
Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l		0.09259	0.104095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			POE concentration	C <sub>w</sub>	mg/m3		0.09259	0.104095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			Water Ingestion rate	IR	l/d	1																					
			Exposure frequency	EF	d/y	350																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
			Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		5.07342E-07	5.81342E-07	6.6924E-05	4.15342E-05	0.000222082	1.02175E-06	5.4611E-07	0.000180712	0.000214959	1.05786E-06	4.1751E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	8.81094E-07	5.10877E-07	6.16573E-07			
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	6.80E-01	6.70E+00	6.70E+00	4.50E-01	4.50E-01	4.00E-01	4.00E-01	4.00E-01				
			Risk	R	fraction		1.01E-07	3.31E-08				9.30E-08	3.71E-08	5.16E-06	1.16E-08	2.84E-06	9.77E-06	2.84E-06	7.33E-07	3.52E-07	3.52E-07	2.04E-07	2.47E-07				
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.919E-06	6.78233E-06	0.000780804	0.000484566	0.002590959	1.19205E-05	6.37128E-06	0.002108311	0.002507854	1.23417E-05	4.87095E-05	1.70046E-05	0.000226685	1.90163E-05	1.22188E-05	1.02795E-05	5.96023E-06	7.19338E-06			
			Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03	1.00E-04	1.00E-04	7.00E-05					
			Hazard Quotient	HQ	mg/kg-d		9.86499E-05	0.001695582	0.007808037	0.048456621	0.25909589	0.000596023	0.005792071	0.070277017	0.083595129	0.123417352	0.024354726	0.017004566	0.045336986	0.000122157991	0.146849315						
Total Hazard Index	HI	mg/kg-d																									
		Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l		0.09259	0.104095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			event duration	t <sub>event</sub>	hr	1																					
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event		1.71293E-09	1.45785E-09	1.44936E-07	1.01602E-07	7.82499E-06	1.3784E-09	1.44735E-09	4.44855E-06	3.83727E-06	2.15732E-08	6.90925E-09	0	5.85864E-08	1.76154E-08	1.92059E-09	0	3.9849E-08	4.80936E-08			
			Event frequency	EV	events/day	1																					
			Exposure duration	ED	y	6																					
			Exposure frequency	EF	d/y	350																					
			Skin surface area	SA	cm2	6,600																					
			Body weight	BW	kg	15																					
			Averaging time	AT	d/y	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		6.19446E-08	5.27224E-08	5.24152E-06	3.67439E-06	0.000282986	4.9849E-08	5.23424E-08	0.000160879	0.000138773	7.80182E-07	2.49869E-07	0	2.11874E-06	6.37049E-07	6.9457E-08	0	1.44112E-06	1.73928E-06			
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	8.00E-01	6.70E+00	6.70E+00	4.50E-01	4.50E-01	4.00E-01	4.00E-01	4.00E-01				
			Risk	R	fraction		1.24E-08	3.01E-09				4.54E-09	3.56E-09	3.33E-06	8.58E-09	2.00E-07	0.00E+00	0.00E+00	2.87E-07	0.00E+00	0.00E+00	5.76E-07	6.76E-07				
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		7.22714E-07	6.15094E-07	6.1151E-05	4.28679E-05	0.003301501	5.81572E-07	6.10661E-07	0.001876922	0.001619014	9.10213E-06	2.91513E-06	0	2.47186E-05	7.43224E-06	8.10332E-07	0	1.6813E-05	2.02916E-05			
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03	1.00E-04	1.00E-04	7.00E-05								
Hazard Quotient	HQ	mg/kg-d		1.20452E-05	0.000153774	0.00061151	0.004286789	0.330150105	2.90786E-05	0.000555147	0.062564058	0.05396714	0.091021282	0.001457567	0	0.004943729	0.008103318	0	0								
Total Hazard Index	HI	mg/kg-d																									
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l		0.09259	0.104095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			Concentration in tap water	C <sub>w</sub>	mg/m3		0.09259	0.104095	12.214	7.58	40.53	0.18647	0.099665	32.98	39.23	0.19306	0.761955	0.266	3.546	0.29747	0.19109	0.1608	0.093235	0.112525			
			Volatilization factor	VF	dimensionless	0.0005 y																					
			POE concentration	C <sub>o=po</sub>	mg/m3	0.000046295 y	5.30475E-05 y	0.006107 y	0.00379 y	0.020265 y	0.000093235 y	4.98325E-05 y	0.01649 y	0.019615 y	0	0	0	0.001773 y	0	0	0.0000804 y	0	0				
			Inhalation rate	IR	m3/hr	0.42																					
			Exposure time	ET	h/d	24																					
			Exposure frequency	EF	d/y	350																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
			Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		2.55701E-06	2.92997E-06	0.000337307	0.000209333	0.001119294	5.14964E-06	2.75239E-06	0.00091079	0.001083393	0	0	0	9.79279E-05	0	0	4.44072E-06	0	0			
			Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02	6.80E-02	2.38E-05	1.09E-02	0.00E+00						4.00E-01	4.00E-01	4.00E-01			
			Risk	R	fraction		5.19E-07	1.67E-07				4.69E-07			2.38E-05	0.00E+00						1.78E-06	0.00E+00	0.00E+00			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						



TABLE 7-19  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3,5-triiodobenzene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene
Vapour intrusion - Inhalation	POE concentration	$C_{inh}$	ug/m3	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06	0.00E+00	2.19E-05	2.75E-04
	POE concentration	$C_{inh}$	mg/m3	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09	0.00E+00	2.19E-08	2.75E-07
	Inhalation rate	IR	m3/hr																								
	Exposure time	ET	h/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	$AT_c$	d																								
	Averaging time non-carcinogens	$AT_n$	d																								
	Average intake from inhalation carcinogens	$I_c$	mg/kg-d	1.9221E-12	0	2.76144E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11	0	1.2094E-09	1.5189E-08
Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02				8.10E-02	3.08E-01		7.70E-02	1.61E+00	3.08E-01		
Risk	R	fraction	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11				5.06E-08	0.00E+00		3.18E-12	1.07E-10	0.00E+00		
Total carcinogenic risk for exposure route	$R_c$	fraction																									
Average intake from inhalation non-carcinogens	$I_n$	mg/kg-d	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	0	1.4112E-08	1.77205E-07	
Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d					8.57E-03																				
Hazard Quotient	HQ	mg/kg-d					0.000163164																				
Total Hazard Index	HI	mg/kg-d															0.057615471										0.000206774
Ingestion of tap water	POE concentration	$C_w$	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	POE concentration	$C_w$	mg/m3	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	Water ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	$AT_c$	d																								
	Averaging time non-carcinogens	$AT_n$	d																								
	Average intake from ingestion carcinogens	$I_c$	mg/kg-d	3.52329E-07	2.29014E-07	3.87562E-07	1.58548E-05	0.000221041	2.50153E-06	2.32537E-06	4.30077E-06	2.47781E-06	2.11397E-05	3.06526E-06	0.000422795	8.80822E-06	4.5337E-07	0.007403178	7.22274E-07	4.58027E-05	2.30082E-06	2.90671E-06	2.62485E-06	2.60723E-06	2.47781E-06	1.55452E-06	1.87825E-05
	Ingestion Cancer Slope Factor	$CSF_o$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00				6.20E-02				8.40E-02	7.30E+00		7.80E-02	1.60E+00	7.30E-01	
Risk	R	fraction	1.41E-07	9.16E-08	1.55E-07	6.34E-06	1.22E-05	1.83E-06	1.70E-05	3.14E-06	1.81E-07	2.33E-05				5.92E-06				6.07E-08	1.68E-05		2.05E-07	4.17E-06	1.81E-06		
Total carcinogenic risk for exposure route	$R_c$	fraction																									
Average intake from ingestion non-carcinogens	$I_n$	mg/kg-d	4.1105E-06	2.67183E-06	4.52155E-06	0.000184973	0.002578813	2.91844E-05	2.71293E-05	5.01756E-05	2.89078E-05	0.00024463	3.57614E-05	0.004932603	0.000102763	5.28932E-06	0.086370411	8.42653E-06	0.000534365	2.68429E-05	3.39116E-05	3.06232E-05	3.04177E-05	2.89078E-05	1.81361E-05	0.000219129	
Ingestion Reference Dose	$RfD_o$	mg/kg-d					4.00E-03																				
Hazard Quotient	HQ	mg/kg-d			0.226077626		0.644703196							0.000894034	0.246630137	0.005138128	0.007556164	4.318520548	0.000421326	0.05343653		0.008477911	0.15311621	0.038022146		0.004534018	0.010956438
Total Hazard Index	HI	mg/kg-d																									
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.0643	0.041795	0.07073	2.8935	40.34	0.45653	0.42438	0.78489	0.4522	3.858	0.55941	77.16	1.6075	0.08274	1351.08	0.131815	8.359	0.4199	0.530475	0.479035	0.47582	0.4522	0.2837	3.4278
	event duration	$t_{event}$	hr																								
	absorbed dose per event	$D_{event}$	mg/cm2-event	2.10327E-07	1.46655E-07	3.93971E-07	0.000100654	9.38632E-07	8.44979E-07	1.34667E-06	2.52742E-06	1.43532E-06	1.55725E-08	7.91863E-08	1.73515E-05	1.92954E-08	3.28754E-09	7.11354E-05	1.47044E-09	1.11247E-07	2.06933E-06	1.39311E-07	1.6962E-07	3.2467E-07	1.51745E-06	0	3.29882E-07
	Event frequency	EF	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								
	Averaging time non-carcinogens	$AT_n$	d																								



TABLE 7-19  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern						Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	C <sub>air</sub>	mg/m3	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	AT <sub>c</sub>	d								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d								
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg				2.10E+00	6.00E-03	3.00E-02		
	Risk	R <sub>i</sub>	fraction				1.52E-07	8.28E-09	1.55E-09		
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction							2.81E-07	0%
Ingestion of tap water	Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.86E-02		
	Hazard Quotient	HQ	mg/kg-d	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05		
	Total Hazard Index	HI	mg/kg-d							3.35E-05	0%
	POE concentration	C <sub>w</sub>	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	POE concentration	C <sub>w</sub>	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Water ingestion rate	IR	l/d								
Ingestion of tap water	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	AT <sub>c</sub>	d								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d								
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.02937E-06	2.85386E-05	1.59253E-05	2.36712E-05	6.35616E-05	0.00001286		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01		
	Risk	R <sub>i</sub>	fraction		2.00E-04	1.91E-06	1.28E-05	3.81E-07	9.26E-07		
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction							3.29E-06	11%
	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	2.3676E-05	0.000332951	0.000185795	0.000276164	0.000741553	1.50033E-05		
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.047351963		0.006193157	0.027616438	2.471841705	0.005001111		
	Total Hazard Index	HI	mg/kg-d							9.28E-06	13%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	event duration	t <sub>event</sub>	hr								
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	3.98612E-09	2.54173E-08	5.14528E-06	3.8E-07	2.84437E-07	1.92945E-09		
	Event frequency	EV	events/day								
	Exposure duration	ED	y								
	Exposure frequency	EF	d/y								
	Skin surface area	SA	cm2								
	Body weight	BW	kg								
	Averaging time	AT	d/y								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d								
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.44156E-07	9.192E-07	0.000186076	1.37425E-05	1.02865E-05	6.97772E-08		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01		
	Risk	R <sub>i</sub>	fraction		1.65E-06	2.23E-05	7.42E-06	9.26E-09	5.02E-08		
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction							2.22E-08	72%
Dermal contact with tap water	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.68181E-06	1.0724E-05	0.002170887	0.000160329	0.000120009	8.14068E-07		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d	0.003363629		0.072362894	0.016032862	2.666864567	0.000271356		
	Total Hazard Index	HI	mg/kg-d							1.91E+01	28%
Vapors from tap water  /mol, those with a "Y"	Concentration in tap water	C <sub>w</sub>	ug/l	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.37036	5.2083	2.90636	4.32	11.6	0.234695		
	Volatilization factor	VF	dimensionless y								
	POE concentration	C <sub>air</sub>	mg/m3	0.00018518	0	0	0.00216	0.0058	0.000117348		
	Inhalation rate	IR	m3/hr								
	Exposure time	ET	h/d								
	Exposure frequency	EF	d/y								
	Exposure duration	ED	y								
	Body weight	BW	kg								
	Averaging time carcinogens	AT <sub>c</sub>	d								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d								
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	1.0228E-05	0	0	0.000119303	0.000320351	6.48144E-06		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg				2.10E+00	6.00E-03	3.00E-02		
	Risk	R <sub>i</sub>	fraction				2.51E-04	1.92E-06	1.94E-07		
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction							6.18E-06	17%



TABLE 7-19  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	Aroclor-1222		
Surface Water	Creek	Incidental Ingestion of creek water	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d			2.98317E-05	3.41829E-05	0.00393525	0.002442214	0.013058433	6.00791E-05	3.21112E-05	0.010625885	0.012639584	0	0	0	0.001142492	0	0	5.18084E-05	0	0		
			Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			1.14E-03	1.40E-03	1.14E-03		1.14E-03	1.40E-03	1.14E-03	2.30E-01	2.30E-01											
			Hazard Quotient	HQ	mg/kg-d			11.45476568	0.042913644	0.028167738		0.054954711															
			Total Hazard Index	HI	mg/kg-d																						
			POE concentration	C <sub>po</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07		
			POE concentration	C <sub>po</sub>	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07		
			Water Ingestion rate	IR	l/d	0.05																					
			Exposure frequency	EF	d/y	52																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																								
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																								
Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d			1.57584E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.04286E-12	3.2523E-12	1.74052E-14	1.00943E-14	1.21827E-14					
Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	4.00E-01					
Risk	R	fraction			3.15E-13	3.41E-13				9.54E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.94E-15	4.04E-15	4.87E-15					
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																									
Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22624E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13	1.42132E-13					
Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05							
Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09							
Total Hazard Index	HI	mg/kg-d																									
	Dermal contact with creek water	POE concentration	C <sub>po</sub>	ug/l				3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	2.99297E-07		
		event duration	t <sub>event</sub>	hr	2																						
		absorbed dose per event	D <sub>event</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13	1.80907E-13			
		Event frequency	EF	events/day	1																						
		Exposure duration	ED	y	6																						
		Exposure frequency	EF	d/y	52																						
		Skin surface area	SA	cm2	6,600																						
		Body weight	BW	kg	15																						
		Averaging time	AT	d/y	25,550																						
		Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			5.44227E-12	1.61158E-11	5.04038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.69998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13	9.72014E-13					
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	4.00E-01					
Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.04E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	3.89E-13					
Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction																									
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93645E-10	3.38295E-06	2.94627E-06	7.99456E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12	1.13402E-11					
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05							
Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0							
Total Hazard Index	HI	mg/kg-d																									
Carcinogenic risk - all routes (detected organics)																											
Carcinogenic risk - all routes (undetected organics)																											
TOTAL CARCINOGENIC RISK - ALL ROUTES							Sum R <sub>c</sub>	fraction		6.33E-07	2.03E-07	0.00E+00	0.00E+00	0.00E+00	5.67E-07	4.07E-08	0.00E+00	3.23E-05	2.02E-08	3.04E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	2.13E-06	7.81E-07	9.42E-07
Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES							Sum HI	fraction		0.000110697	0.00184942	0.00841963	0.032773483	12.04632955	0.043627133	0.034575128	0.132958229	0.192637715	0.214447013	0.025812968	0.017004619	0.050281315	0	0.1302624	0.146849318	0	

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-19  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																									
Exposure Route	Parameter	Symbol	Units	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-butadiene	Hexachlorobenzene	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene		
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	2.07169E-05	0	2.27886E-05	0.000932262	0.012997216	0	0	0.000252885	0	0.001243016	0	0	0.000517923	2.66581E-05	0.435306871	4.24697E-05	0.002693201	0	0.000170915	0.000154341	0.000153305	0	9.14058E-05	0.001104409		
	Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d					8.57E-03										1.70E-02								8.57E-04			
	Hazard Quotient	HQ	mg/kg-d					1.516594684										25.60628654									1.288691933		
	Total Hazard Index	HI	mg/kg-d																										
Incidental Ingestion of creek water	POE concentration	C <sub>po</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	POE concentration	C <sub>po</sub>	mg/m3	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	Water Ingestion rate	IR	l/d																										
	Exposure frequency	EF	d/y																										
	Exposure duration	ED	y																										
	Body weight	BW	kg																										
	Averaging time carcinogens	AT <sub>c</sub>	d																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
	Average Intake from Ingestion carcinogens	I <sub>h</sub>	mg/kg-d	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.04082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18437E-14	1.63079E-13	2.14317E-16	4.82755E-12	5.83402E-11		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		6.20E-02	8.40E-02	7.30E+00		7.80E-02	1.60E+00	7.30E-01				
Risk	R	fraction	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17		2.39E-10	1.17E-13	5.62E-12	1.83E-13		6.24E-13	8.40E-13	1.45E-15		7.80E-15	1.60E-13	7.30E-01					
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																											
Average Intake from Ingestion non-carcinogens	I <sub>h</sub>	mg/kg-d	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45437E-07	6.46841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	2.50037E-15	5.63215E-11	6.80436E-10			
Ingestion Reference Dose	RD <sub>h</sub>	mg/kg-d				2.00E-05																							
Hazard Quotient	HQ	mg/kg-d				4.467E-09							9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09		1.40804E-08	3.40318E-08			
Total Hazard Index	HI	mg/kg-d																											
Dermal contact with creek water	POE concentration	C <sub>po</sub>	ug/l	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4594E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	5.26519E-09	0.0001186	0.001433262		
	event duration	t <sub>event</sub>	hr																										
	absorbed dose per event	D <sub>absvent</sub>	mg/cm2-event	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	2.49669E-14	0	2.00333E-10		
	Event frequency	EF	events/day																										
	Exposure duration	ED	y																										
	Exposure frequency	EF	d/y																										
	Skin surface area	SA	cm2																										
	Body weight	BW	kg																										
	Averaging time	AT	d/y																										
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																										
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	1.34255E-13	0	1.07639E-09			
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		6.20E-02	8.40E-02	7.30E+00		7.80E-02	1.60E+00	2.30E-01					
Risk	R	fraction	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12	1.30E-12	1.34E-12		2.67E-13	3.32E-11	3.09E-14					
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																											
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55844E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	1.5663E-12	0	1.25579E-08			
Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d				2.00E-05																							
Hazard Quotient	HQ	mg/kg-d				4.64479E-06							2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07		4.00E-03	2.00E-02			
Total Hazard Index	HI	mg/kg-d																											
Carcinogenic risk - all routes (detected organics)																													
Carcinogenic risk - all routes (undetected organics)																													
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	3.89E-06	2.21E-06	6.64E-06	1.49E-03	4.44E-05	9.01E-06	1.31E-04	1.19E-05	3.97E-06	1.47E-04	0.00E+00	1.47E-05	5.89E-07	1.93E-07	0.00E+00	6.51E-08	1.87E-05	5.63E-04	0.00E+00	1.70E-06	4.41E-05	1.44E-05	0.00E+00	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																													
Non-Carcinogenic risk - all routes (undetected organics)																													
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	8.537250358	0	2.260469962	0	0	0	0	0.001729539	2.173180576	0.005545353	0.009537899	34.82439968	0.00045236	0.078913003	0	0.023172374	0.510945735	0.209252755	0	0.004534032	1.306814953	



TABLE 7-19  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL B)  
MISSOURI ELECTRIC WORKS

		Chemicals of Potential Concern							Total	Rf Contribution
Exposure Route	Parameter	Symbol	Units	Nitrobenzene	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	
	Average Intake from Inhalation non-carcinogens	$I_{inh}$	mg/kg-d	0.000119327	0	0	0.001391868	0.003737425	7.56168E-05	
	Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d	5.71E-04			1.40E-01	1.14E-02	2.86E-02	
	Hazard Quotient	HQ	mg/kg-d	0.208978893			0.009941918	0.327844268	0.002643944	
	Total Hazard Index	HI	mg/kg-d						4.08E-01	59%
Incidental Ingestion of creek water	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	POE concentration	$C_w$	mg/m3	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	Water ingestion rate	IR	l/d							
	Exposure frequency	EF	d/y							
	Exposure duration	ED	y							
	Body weight	BW	kg							
	Averaging time carcinogens	$AT_c$	d							
	Averaging time non-carcinogens	$AT_{nc}$	d							
	Average Intake from Ingestion carcinogens	$I_{ing}$	mg/kg-d	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11	
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg		7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01	
	Risk	R	fraction		2.06E-09	3.78E-14	1.85E-11	7.16E-12	9.52E-12	
	Total carcinogenic risk for exposure route	$R_i$	fraction						2.73E-08	0%
	Average Intake from Ingestion non-carcinogens	$I_{ing}$	mg/kg-d	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10	
	Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d				3.00E-02	1.00E-02	3.00E-04	
	Hazard Quotient	HQ	mg/kg-d	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08	
	Total Hazard Index	HI	mg/kg-d						9.92E-08	0%
Dermal contact with creek water	POE concentration	$C_w$	ug/l	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004	
	event duration	$t_{event}$	hr							
	absorbed dose per event	$D_{aevent}$	mg/cm2-event	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12	
	Event frequency	EF	events/day							
	Exposure duration	ED	y							
	Exposure frequency	EF	d/y							
	Skin surface area	SA	cm2							
	Body weight	BW	kg							
	Averaging time	AT	d/y							
	Averaging time non-carcinogens	$AT_{nc}$	d							
	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11	
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01	
	Risk	R	fraction		5.11E-10	1.25E-11	3.04E-10	5.16E-12	1.73E-11	
	Total carcinogenic risk for exposure route	$R_i$	fraction						6.17E-09	0%
	Absorbed dose for non-carcinogens	$DAD_{nc}$	mg/kg-d	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10	
	Dermal Reference Dose	$RfD_{der}$	mg/kg-d				3.00E-02	1.00E-02	4.50E-05	
	Hazard Quotient	HQ	mg/kg-d	3.16778E-07		4.04408E-08	6.55894E-07	0.00148579	9.32089E-08	
	Total Hazard Index	HI	mg/kg-d						2.84E-06	0%
Carcinogenic risk - all routes (detected organics)									2.23E-03	
Carcinogenic risk - all routes (undetected organics)									8.25E-04	
TOTAL CARCINOGENIC RISK - ALL ROUTES									3.04E-03	
Non-Carcinogenic risk - all routes (detected organics)									5.87E-01	
Non-Carcinogenic risk - all routes (undetected organics)									1.01E+01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES									4.89E+01	



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	
				POE concentration	C <sub>POE</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03			2.30E-01									
				Hazard Quotient	HQ	mg/kg-d					0.002311867	8.83726E-05	5.99164E-05			1.72583E-05									
				Total Hazard Index	HI	mg/kg-d																			
Groundwater	Tap Water		Ingestion of tap water	POE concentration	C <sub>POE</sub>	ug/l		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08	
				POE concentration	C <sub>POE</sub>	mg/m3		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08	
				Water Ingestion rate	IR	l/d	1																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		1.21942E-12	8.04658E-14	1.6086E-10	6.68493E-12	1.07397E-11	1.41425E-13	7.5589E-14	8.9863E-11	9.91781E-11	2.54263E-12	5.7789E-13	3.50137E-12	4.67014E-11	3.91773E-12	2.51668E-12	1.21918E-13	7.07123E-14	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01	2.51668E-12	1.21918E-13	4.00E-01	
				Risk	R <sub>i</sub>	fraction		2.44E-13	4.59E-15				1.29E-14	5.14E-15		2.38E-12	2.80E-14	3.93E-13	2.35E-11		1.76E-12	4.88E-14	2.83E-14	4.00E-01	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.42266E-11	9.38767E-13	1.8767E-09	7.79909E-11	1.25297E-10	1.64995E-12	8.81872E-13	1.0484E-09	1.15708E-09	2.9664E-11	6.74205E-12	4.08493E-11	5.44849E-10	4.57068E-11	2.93613E-11	1.42237E-12	8.24977E-13	
				Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		2.3711E-10	2.34692E-10	1.8767E-08	7.79909E-09	1.25297E-08	8.24977E-11	8.01702E-10	3.49467E-08	3.85693E-08	2.9664E-07	3.37103E-09	4.08493E-08	1.0897E-07		2.93613E-07	2.03196E-08		
				Total Hazard Index	HI	mg/kg-d																			
							Dermal contact with tap water	POE concentration	C <sub>POE</sub>	ug/l		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07
event duration	t <sub>event</sub>	hr	1																						
absorbed dose per event	D <sub>abs</sub>	mg/cm2-event						4.11711E-15	2.01787E-16	3.48361E-13	1.63529E-14	3.7841E-13	1.9079E-16	2.00333E-16	2.21213E-12	1.77045E-12	5.18524E-14	9.56334E-16	0	1.40816E-13	4.23395E-14	4.61624E-15	0	5.51565E-15	
Event frequency	EF	events/day	1																						
Exposure duration	ED	y	6																						
Exposure frequency	EF	d/y	350																						
Skin surface area	SA	cm2	6,600																						
Body weight	BW	kg	15																						
Averaging time	AT	d/y	25,550																						
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d						1.48893E-13	7.2975E-15	1.25983E-11	5.91393E-13	1.3685E-11	6.89979E-15	7.2449E-15	8.00005E-11	6.40271E-11	1.87521E-12	3.45852E-14	0	5.09251E-12	1.53118E-12	1.66944E-13	0	1.9947E-13	
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
Risk	R <sub>i</sub>	fraction						2.98E-14	4.16E-16				6.28E-16	4.93E-16		1.54E-12	2.06E-14	2.77E-14	0.00E+00		6.89E-13	0.00E+00	7.98E-14	7.98E-14	
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d						1.73708E-12	8.51374E-14	1.4698E-10	6.89958E-12	1.59658E-10	8.04975E-14	8.45239E-14	9.33339E-10	7.46983E-10	2.18775E-11	4.03494E-13	0	5.94126E-11	1.78638E-11	1.94768E-12	0	2.32715E-12	
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d						2.89514E-11	2.12844E-11	1.4698E-09	6.89958E-10	1.59658E-08	4.02488E-12	7.68399E-11	3.11113E-08	2.48994E-08	2.18775E-07	2.01747E-10	0	1.18825E-08		1.94768E-08	0		
Total Hazard Index	HI	mg/kg-d																							
(only calculated for COPC with Henry's Law > 1e-5 atm m3/mol, those with a "Y")	Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>POE</sub>	ug/l		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08	
				Concentration in tap water	C <sub>POE</sub>	mg/m3		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08	
				Volatilization factor	VF	dimensionless	0.0005 y																		
				POE concentration	C <sub>POE</sub>	mg/m3		1.11273E-10	7.3425E-12	1.46785E-08	6.1E-10	9.8E-10	1.2905E-11	6.8975E-12		8.2E-09	9.05E-09	0	0	0	4.2615E-09	0	0	1.1125E-11	0
				Inhalation rate	IR	m3/hr	0.42																		



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	Bit(2-Chloroethyl) Ether	Bit(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour intrusion - Inhalation	POE concentration	$C_{air}$	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	$C_{soil}$	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	$AT_c$	d																						
	Averaging time non-carcinogens	$AT_n$	d																						
	Average Intake from inhalation carcinogens	$I_c$	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11
	Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02		8.10E-02	3.08E-01		7.70E-02	1.61E+00	
	Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11		5.06E-08	0.00E+00		3.25E-07	7.48E-10	1.07E-10
	Total carcinogenic risk for exposure route	$R_t$	fraction																						
Average Intake from inhalation non-carcinogens	$I_n$	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	
Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d						8.57E-03											1.70E-02						
Hazard Quotient	HQ	mg/kg-d						0.000163164											0.057615471						
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	$C_w$	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	POE concentration	$C_{soil}$	mg/m3	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	$AT_c$	d																						
	Averaging time non-carcinogens	$AT_n$	d																						
	Average Intake from ingestion carcinogens	$I_c$	mg/kg-d	8.53425E-14	4.87671E-14	3.16986E-14	5.36438E-14	2.19452E-12	8E-12	3.46247E-13	3.21863E-13	5.92521E-13	3.4137E-13	2.92603E-12	4.24274E-13	5.85205E-11	1.21918E-12	1.0897E-12	1.3589E-10	9.99726E-14	6.33973E-12	3.16986E-13	4.02329E-13	3.63315E-13	3.60877E-13
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00				1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
	Risk	R	fraction	3.41E-14	1.95E-14	1.27E-14	2.15E-14	8.78E-13	4.40E-13	2.53E-13	2.35E-12	4.33E-13	2.49E-14	3.22E-12				8.19E-13	7.56E-14	1.42E-13		8.40E-15		2.83E-14	5.77E-13
	Total carcinogenic risk for exposure route	$R_t$	fraction																						
	Average Intake from ingestion non-carcinogens	$I_n$	mg/kg-d	9.95662E-13	5.6895E-13	3.69817E-13	6.25845E-13	2.56027E-11	9.33333E-11	4.03954E-12	3.75507E-12	6.91274E-12	3.98265E-12	3.4137E-11	4.94986E-12	6.8274E-10	1.42237E-11	1.27132E-11	1.58539E-09	1.16635E-12	7.39635E-11	3.69817E-12	4.69384E-12	4.23868E-12	4.21023E-12
Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d				3.12922E-08		2.33333E-08						1.23747E-10	3.4137E-08	7.11187E-10	1.81616E-08	7.92694E-08	5.83174E-11	7.39635E-09		1.17346E-09	2.11934E-08	5.26279E-09	
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	$C_w$	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	event duration	$t_{event}$	hr																						
	absorbed dose per event	$D_{abs}$	mg/cm2-event	6.65682E-15	2.91121E-14	2.02991E-14	5.4531E-14	1.39319E-11	3.39713E-14	1.16957E-13	1.86397E-13	3.48205E-13	1.97746E-13	2.15545E-15	1.09605E-14	2.40168E-12	2.67075E-15	7.90178E-15	1.30574E-12	2.03529E-16	1.53981E-14	2.85093E-13	1.92826E-14	2.34778E-14	4.49388E-14
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	$AT_n$	d																						
	Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	2.4074E-13	1.05282E-12	7.34104E-13	1.97208E-12	5.03839E-10	1.22855E-12	4.22967E-12	6.74093E-12	1.25926E-11	7.15136E-12	7.79505E-14	3.96379E-13	8.68552E-11	9.6586E-14	2.85763E-13	4.72213E-11	7.3605E-15	5.56864E-13	1.03102E-11	6.97342E-13	8.4904E-13	1.62519E-12
	Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg	4.00E-01	4.00E-01																				



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern									Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38062E-06	5.1698E-08		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02		
	Risk	R	fraction	0.00E+00						1.52E-07	5.52E-07	1.55E-09		
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										7.95E-07	98%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42892E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02		
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02959E-06	0.001413122	2.10889E-05		
	Total Hazard Index	HI	mg/kg-d										6.19E-05	95%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08		
	POE concentration	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08		
	Water ingestion rate	IR	l/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	3.4137E-13	3.73589E-12	4.51447E-11	4.8777E-12	3.95014E-12	2.20427E-12	5.19452E-12	6.57534E-12	1.78E-13		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01		
	Risk	R	fraction	2.49E-13				2.77E-11	2.65E-13	2.81E-12	2.63E-12	1.28E-13		
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										7.37E-11	0%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.98265E-12	4.35854E-11	5.26688E-10	5.69065E-11	4.60849E-11	2.57165E-11	6.06027E-11	7.67123E-11	2.07667E-12		
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d		1.08963E-08	2.63344E-08	1.13813E-07		8.57218E-10	6.06027E-09	2.55708E-07	6.92222E-10		
	Total Hazard Index	HI	mg/kg-d										1.41E-06	0%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08		
	event duration	t <sub>event</sub>	hr											
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	2.0906E-13	0	7.92888E-13	9.58085E-15	3.5181E-15	7.12178E-13	8.33888E-14	2.94245E-14	2.67062E-16		
	Event frequency	EF	events/day											
	Exposure duration	ED	y											
	Exposure frequency	EF	d/y											
	Skin surface area	SA	cm2											
	Body weight	BW	kg											
	Averaging time	AT	d/y											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	7.56054E-12	0	2.86743E-11	3.46485E-13	1.2723E-13	2.57555E-11	3.0157E-12	1.06412E-12	9.65812E-15		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01		
	Risk	R	fraction	1.74E-12				2.29E-13	3.09E-12	1.63E-12	6.38E-14	6.95E-15		
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										3.09E-10	0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	8.82063E-11	0	3.34534E-10	4.04233E-12	1.48435E-12	3.0048E-10	3.51832E-11	1.24147E-11	1.12678E-13		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d		0	1.67267E-08	8.08466E-09		1.0016E-08	3.51832E-09	2.75883E-07	3.75594E-11		
	Total Hazard Index	HI	mg/kg-d										2.23E-06	0%
Vapors from tap water not those with a "Y"	Concentration in tap water	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08		
	Concentration in tap water	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08		
	Volatilization factor	VF	dimensionless											
	POE concentration	C <sub>air</sub>	mg/m3	0	3.409E-10	4.11945E-09	4.4509E-10	0	0	4.74E-10	6E-10	1.62425E-11		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.88289E-11	2.27529E-10	2.45836E-11	0	0	2.61804E-11	3.31397E-11	8.9712E-13		



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichlorobenzene	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Acroder-1016	Acroder-1221	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		1.25E-12	2.31E-14				6.49E-14			1.10E-11	0.00E+00						2.46E-13	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		7.17022E-11	4.73139E-12	9.45858E-09	3.93074E-10	6.31496E-10	8.31577E-12	4.44464E-12	5.28395E-09	5.83167E-09	0	0	0	2.74404E-09	0	0	7.16877E-12	0	
				Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01									
				Hazard Quotient	HQ	mg/kg-d						5.53944E-07	5.93984E-09	3.8988E-09		2.53551E-08									
				Total Hazard Index	HI	mg/kg-d																			
				POE concentration	C <sub>pw</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				Water Ingestion rate	IR	l/d	0.05	3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				Exposure frequency	EF	d/y	52																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Ingestion carcinogens	I <sub>h</sub>	mg/kg-d		1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.04286E-12	3.2523E-12	1.74052E-14	1.00943E-14	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Ingestion non-carcinogens	I <sub>h</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13	
				Ingestion Reference Dose	RTD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09		
				Total Hazard Index	HI	mg/kg-d																			
				POE concentration	C <sub>pw</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				event duration	tevent	hr	2																		
				absorbed dose per event	D <sub>awevent</sub>	mg/cm2-event		1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13	
				Event frequency	EV	events/day	1																		
				Exposure duration	ED	y	6																		
				Exposure frequency	EF	d/y	52																		
				Skin surface area	SA	cm2	6,600																		
				Body weight	BW	kg	15																		
				Averaging time	AT	d/y	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
								Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
Risk	R <sub>i</sub>	fraction						1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d						6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12	
Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d						1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0		
Total Hazard Index	HI	mg/kg-d																							
Carcinogenic risk - all routes (detected organics)																									
Carcinogenic risk - all routes (undetected organics)																									
TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>i</sub>	fraction						8.80E-11	2.94E-10	0.00E+00	0.00E+00	0.00E+00	9.68E-10	1.52E-12	0.00E+00	1.39E-08	8.39E-13	8.78E-11	5.38E-11	0.00E+00	2.99E-11	0.00E+00	1.80E-12	4.34E-13	
Non-Carcinogenic risk - all routes (detected organics)																									
Non-Carcinogenic risk - all routes (undetected organics)																									
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum HI	fraction		1.6307E-09	6.47029E-08	1.03627E-07	3.00821E-05	0.002318458	8.83941E-05	6.01568E-05	0.00011722	0.000120823	8.89532E-06	6.78207E-07	9.36566E-08	7.20706E-07	0	1.40443E-06	2.32205E-08	0					

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liter per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																								
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.14E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00			
	Risk	R	fraction	0.00E+00	9.83E-14	0.00E+00	1.08E-13	4.42E-12	1.10E-12	0.00E+00	0.00E+00	9.20E-13	0.00E+00	1.71E-11				2.86E-13			2.59E-12	0.00E+00		1.41E-13	2.93E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.86751E-12	0	3.15426E-12	1.29038E-10	4.704E-10	0	0	3.48402E-11	0	1.7205E-10	0	0	7.16877E-11	6.40743E-11	7.99036E-09	5.87839E-12	3.72776E-10	0	2.36569E-11	2.13629E-11	2.12196E-11			
	Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02									
	Hazard Quotient	HQ	mg/kg-d					5.48891E-08											4.70021E-07									
	Total Hazard Index	HI	mg/kg-d																									
	POE concentration	C <sub>pw</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	POE concentration	C <sub>pw</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	Water Ingestion rate	IR	l/d																									
	Exposure frequency	EF	d/y																									
	Exposure duration	ED	y																									
	Body weight	BW	kg																									
	Averaging time carcinogens	AT <sub>c</sub>	d																									
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																									
	Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.04082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00			
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.04E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13		1.45E-15		4.05E-15	2.61E-13			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Average intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12			
	Ingestion Reference Dose	RTD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04			
	Hazard Quotient	HQ	mg/kg-d				4.467E-09		4.33179E-07						9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09			
	Total Hazard Index	HI	mg/kg-d																									
	POE concentration	C <sub>pw</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06			
	event duration	tevent	hr																									
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52666E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12			
	Event frequency	EF	events/day																									
	Exposure duration	ED	y																									
	Exposure frequency	EF	d/y																									
	Skin surface area	SA	cm2																									
	Body weight	BW	kg																									
	Averaging time	AT	d/y																									
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																									
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00			
	Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12		2.67E-13	3.32E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55844E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10			
	Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04			
	Hazard Quotient	HQ	mg/kg-d				4.64479E-06		2.13966E-06						2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07			
	Total Hazard Index	HI	mg/kg-d																									
	Carcinogenic risk - all routes (detected organics)																											
	Carcinogenic risk - all routes (undetected organics)																											
	TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	5.24E-13	3.01E-12	1.49E-12	5.21E-12	1.07E-09	3.32E-09	5.30E-12	8.25E-11	2.53E-12	5.56E-13	2.68E-08	0.00E+00	7.06E-12	1.83E-11	8.94E-11	0.00E+00	1.93E-12	5.04E-08	7.89E-11	0.00E+00	3.69E-12	1.46E-10
	Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																												
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	5.83093E-06	0	0.000165818	0	0	0	0	2.52443E-07	1.38234E-06	1.72056E-07	2.24747E-07	0.058737811	1.34225E-08	7.91025E-06	0	1.1587E-08	2.73724E-07	3.34273E-07		



TABLE 7-20  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						5.50E-11	1.33E-11	2.69E-14			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										1.15E-10		0%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.1967E-10	2.65451E-09	2.86809E-10	0	0	3.05438E-10	3.8663E-10	1.04664E-11			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			3.09744E-06	5.02292E-07			2.1817E-09	3.39149E-08	3.65958E-10			
	Total Hazard Index	HI	mg/kg-d										4.95E-05		0%
Incidental ingestion of creek water	POE concentration	C <sub>pw</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>pw</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	4.78E-10	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										1.62E-10		0%
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d										8.95E-05		0%
Dermal contact with creek water	POE concentration	C <sub>pw</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83447E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E+01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	3.44E-10	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										8.51E-09		1%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d										2.84E-03		4%
Carcinogenic risk - all routes (detected organics)														8.04E-07	
Carcinogenic risk - all routes (undetected organics)														3.49E-09	
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>i</sub>	fraction	2.02E-12	0.00E+00	0.00E+00	0.00E+00	2.59E-09	1.59E-11	1.52E-07	5.53E-07	1.58E-09	8.07E-07
Non-Carcinogenic risk - all routes (detected organics)														6.47E-02	
Non-Carcinogenic risk - all routes (undetected organics)														1.97E-04	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	2.49767E-08	0.000210577	8.84096E-06	0	5.14364E-08	6.73719E-06	0.002945885	2.12347E-05	6.49E-02



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																			
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221		
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00		
				POE concentration	C <sub>air</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00		
				Inhalation rate	IR	m3/hr	0.42																			
				Exposure time	ET	h/d	24																			
				Exposure frequency	EF	d/y	350																			
				Exposure duration	ED	y	6																			
				Body weight	BW	kg	15																			
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																			
				Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																			
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0		
				Inhalation Cancer Slope Factor	CSF <sub>Inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			1.09E-02							4.00E-01	4.00E-01		
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00		
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																				
				Average Intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63533E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0		
				Inhalation Reference Dose	RD <sub>Inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01										
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05										
				Total Hazard Index	HI	mg/kg-d																				
Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08		
			POE concentration	C <sub>w</sub>	mg/m3			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08		
			Water Ingestion rate	IR	l/d	1																				
			Exposure frequency	EF	d/y	350																				
			Exposure duration	ED	y	6																				
			Body weight	BW	kg	15																				
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																				
			Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		1.21942E-12	8.04658E-14	1.6086E-10	6.68493E-12	1.07397E-11	1.41425E-13	7.5589E-14	8.9863E-11	9.91781E-11	2.54263E-12	5.7789E-13	3.50137E-12	4.67014E-11	3.91773E-12	2.51668E-12	1.21918E-13	7.07123E-14			
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction		2.44E-13	4.59E-15				1.29E-14	5.14E-15		2.38E-12	2.80E-14	3.93E-13	2.35E-11		1.76E-12		4.88E-14	2.83E-14			
			Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																					
			Average Intake from Ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d		1.42266E-11	9.38767E-13	1.8767E-09	7.79909E-11	1.25297E-10	1.64995E-12	8.81872E-13	1.0484E-09	1.15708E-09	2.9664E-11	6.74205E-12	4.08493E-11	5.44849E-10	4.57068E-11	2.93613E-11	1.42237E-12	8.24977E-13			
			Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d		2.3711E-10	2.34692E-10	1.8767E-08	7.79909E-09	1.25297E-08	8.24977E-11	8.01702E-10	3.49467E-08	3.85693E-08	2.9664E-07	3.37103E-09	4.08493E-08	1.0897E-07		2.93613E-07	2.03196E-08				
			Total Hazard Index	HI	mg/kg-d																					
		Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08		
			event duration	t <sub>event</sub>	hr	1																				
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event		4.11711E-15	2.01787E-16	3.48361E-13	1.63529E-14	3.7841E-13	1.9079E-16	2.00333E-16	2.21213E-12	1.77045E-12	5.18524E-14	9.56334E-16	0	1.40816E-13	4.23395E-14	4.61624E-15	0	5.51565E-15			
			Event frequency	EV	events/day	1																				
			Exposure duration	ED	y	6																				
			Exposure frequency	EF	d/y	350																				
			Skin surface area	SA	cm2	6,600																				
			Body weight	BW	kg	15																				
			Averaging time	AT	d/y	25,550																				
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																				
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.48893E-13	7.2975E-15	1.25983E-11	5.91393E-13	1.3685E-11	6.89979E-15	7.2449E-15	8.00005E-11	6.40271E-11	1.87521E-12	3.45852E-14	0	5.09251E-12	1.53118E-12	1.66944E-13	0	1.9947E-13			
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction		2.98E-14	4.16E-16				6.28E-16	4.93E-16		1.54E-12	2.06E-14	2.77E-14	0.00E+00		6.89E-13		0.00E+00	7.98E-14			
			Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																					
			Absorbed dose for non-carcinogens	DAD <sub>no</sub>	mg/kg-d		1.73708E-12	8.51374E-14	1.4698E-10	6.89958E-12	1.59658E-10	8.04975E-14	8.45239E-14	9.33339E-10	7.46983E-10	2.18775E-11	4.03494E-13	0	5.94126E-11	1.78638E-11	1.94768E-12	0	2.32715E-12			
			Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
Hazard Quotient	HQ	mg/kg-d		2.89514E-11	2.12844E-11	1.4698E-09	6.89958E-10	1.59658E-08	4.02488E-12	7.68399E-11	3.11113E-08	2.48994E-08	2.18775E-07	2.01747E-10	0	1.18825E-08		1.94768E-08	0							
Total Hazard Index	HI	mg/kg-d																								
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08		
			Concentration in tap water	C <sub>w</sub>	mg/m3			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08		
			Volatilization factor	VF	dimensionless	0.0005 y																				
			POE concentration	C <sub>air</sub>	mg/m3		1.11273E-10	7.3425E-12	1.46785E-08	6.1E-10	9.8E-10	1.2908E-11	6.8975E-12	8.2E-8												



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloroisopropyl) Ether	Bi(2-ethylhexyl phthalate)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02	8.10E-02	3.08E-01		7.70E-02	1.61E+00		
	Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
Average Intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d						0.000163164										0.057615471							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	POE concentration	C <sub>w</sub>	mg/m3	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	8.53425E-14	4.87671E-14	3.16986E-14	5.36438E-14	2.19452E-12	6E-12	3.46247E-13	3.21863E-13	5.92521E-13	3.4137E-13	2.92603E-12	4.24274E-13	5.85205E-11	1.21918E-12	1.0897E-12	1.3889E-10	9.99726E-14	6.33973E-12	3.16986E-13	4.02329E-13	3.63315E-13	3.60877E-13
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00			1.40E-02	6.20E-02	1.30E-01		8.40E-02	7.30E+00		7.80E-02	1.60E+00
	Risk	R	fraction	3.41E-14	1.95E-14	1.27E-14	2.15E-14	8.78E-13	4.40E-13	2.53E-13	2.35E-12	4.33E-13	2.49E-14	3.22E-12			8.19E-13	7.56E-14	1.42E-13		8.40E-15	2.31E-12		2.83E-14	5.77E-13
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
	Average Intake from Ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d	9.95662E-13	5.6895E-13	3.69817E-13	6.25845E-13	2.56027E-11	9.33333E-11	4.03954E-12	3.75507E-12	6.91274E-12	3.98265E-12	3.4137E-11	4.94986E-12	6.8274E-10	1.42237E-11	1.27132E-11	1.58539E-09	1.16635E-12	7.39635E-11	3.69817E-12	4.69384E-12	4.23868E-12	4.21023E-12
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d				3.12922E-08		2.33333E-08						1.23747E-10	3.4137E-08	7.11187E-10	1.81616E-08	7.92694E-08	5.83174E-11	7.39635E-09		1.17346E-09	2.11934E-08	5.26279E-09	
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08
	event duration	t <sub>event</sub>	hr																						
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	6.65682E-15	2.91121E-14	2.02991E-14	5.4531E-14	1.39319E-11	3.39713E-14	1.16957E-13	1.86397E-13	3.48205E-13	1.97746E-13	2.15545E-15	1.09605E-14	2.40168E-12	2.67075E-15	7.90178E-15	1.30574E-12	2.03529E-16	1.53981E-14	2.85093E-13	1.92826E-14	2.34778E-14	4.49388E-14
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	2.4074E-13	1.05282E-12	7.34104E-13	1.97208E-12	5.03839E-10	1.22855E-12	4.22967E-12	6.74093E-12	1.25926E-11	7.15136E-12	7.79505E-14	3.96379E-13	8.68552E-11	9.6584E-14	2.85763E-13	4.72213E-11	7.3605E-15	5.5684E-13	1.03102E-11	6.97342E-13	8.4904E-13	1.62519E-12
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/m																						



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosod-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour intrusion - Inhalation	POE concentration	C <sub>so-air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>so-air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2094E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	2.76E-08	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										2.30E-09		96%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02989E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										6.19E-05		95%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	POE concentration	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	3.4137E-13	3.73589E-12	4.51447E-11	4.8777E-12	3.95014E-12	2.20427E-12	5.19452E-12	6.57534E-12	1.78E-13			
	Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01			
	Risk	R	fraction	2.49E-13				2.77E-11	2.65E-13	2.81E-12	1.32E-13	1.28E-13			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.12E-13		0%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.98265E-12	4.35854E-11	5.26688E-10	5.69065E-11	4.60849E-11	2.57165E-11	6.06027E-11	7.67123E-11	2.07667E-12			
	Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.08963E-08	2.63344E-08	1.13813E-07		8.57218E-10	6.06027E-09	2.55708E-07	6.92222E-10			
	Total Hazard Index	HI	mg/kg-d										1.51E-08		0%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	2.0906E-13	0	7.92888E-13	9.58085E-15	3.5181E-15	7.12178E-13	8.33888E-14	2.94245E-14	2.67062E-16			
	Event frequency	EV	events/day												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	7.56054E-12	0	2.86743E-11	3.44485E-13	1.2723E-13	2.57555E-11	3.0157E-12	1.06412E-12	9.65812E-15			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01			
	Risk	R	fraction	1.74E-12				2.29E-13	3.09E-12	1.63E-12	3.19E-15	6.95E-15			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										3.09E-15		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	8.82063E-11	0	3.34534E-10	4.04233E-12	1.48435E-12	3.0048E-10	3.51832E-11	1.24147E-11	1.12678E-13			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	1.67267E-08	8.08466E-09		1.0016E-08	3.51832E-09	2.75883E-07	3.75594E-11			
	Total Hazard Index	HI	mg/kg-d										2.23E-06		0%
Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Concentration in tap water	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>so-tap</sub>	mg/m3	0	3.409E-10	4.11945E-09	4.4509E-10	0	0	4.74E-10	6E-10	1.62425E-11			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.88289E-11	2.27529E-10	2.45836E-11	0	0	2.61804E-11	3.31397E-11	8.9712E-13			
not those with a "Y"															



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE ICE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																	
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01
				Risk	R <sub>i</sub>	fraction		1.25E-12	2.31E-14				6.49E-14			1.10E-11	0.00E+00						2.46E-13	0.00E+00
				Total carcinogenic risk for exposure route		fraction																		
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		7.17022E-11	4.73139E-12	9.45858E-09	3.93074E-10	6.31496E-10	8.31577E-12	4.44464E-12	5.28395E-09	5.83167E-09	0	0	0	2.74604E-09	0	0	7.16877E-12	0
				Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01								
				Hazard Quotient	HQ	mg/kg-d						5.53944E-07	5.93984E-09	3.8988E-09		2.53551E-08								
				Total Hazard Index	HI	mg/kg-d																		
Surface Water	Creek	Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			POE concentration	C <sub>w</sub>	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			Water Ingestion rate	IR	l/d		0.05																	
			Exposure frequency	EF	d/y		52																	
			Exposure duration	ED	y		6																	
			Body weight	BW	kg		15																	
			Averaging time carcinogens	AT <sub>c</sub>	d		25,550																	
			Averaging time non-carcinogens	AT <sub>n</sub>	d		2,190																	
			Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d			1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
			Risk	R <sub>i</sub>	fraction			3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15
			Total carcinogenic risk for exposure route																					
			Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13
			Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
			Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09	
			Total Hazard Index	HI	mg/kg-d																			
		Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			event duration	t <sub>event</sub>	hr		2																	
			absorbed dose per event	D <sub>abs event</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13
			Event frequency	EV	events/day		1																	
			Exposure duration	ED	y		6																	
			Exposure frequency	EF	d/y		52																	
			Skin surface area	SA	cm2		6,800																	
			Body weight	BW	kg		15																	
			Averaging time	AT	d/y		25,550																	
			Averaging time non-carcinogens	AT <sub>n</sub>	d		2,190																	
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10204E-12	0	8.05383E-13
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
			Risk	R <sub>i</sub>	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13
			Total carcinogenic risk for exposure route																					
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12
			Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0				
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction			8.80E-11	2.94E-10	0.00E+00	0.00E+00	0.00E+00	9.68E-10	1.52E-12	0.00E+00	1.39E-08	8.39E-13	8.78E-11	5.38E-11	0.00E+00	2.99E-11	0.00E+00	1.80E-12	4.34E-13
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction			1.6307E-09	6.47029E-08	1.03527E-07	3.00821E-05	0.002318458	8.83941E-05	6.01568E-05	0.00011722	0.000120823	8.89532E-06	6.78207E-07	9.36566E-08	7.20706E-07	0	1.40443E-06	2.32205E-08	0

Notes:  
1- ug/l = micrograms per Liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis(2-ethylhexyl) phthalate	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02								
	Risk	R	fraction	0.00E+00	9.63E-14	0.00E+00	1.08E-13	4.42E-12	1.10E-12	0.00E+00	0.00E+00	9.20E-13	0.00E+00	1.71E-11				2.86E-13								
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Average intake from inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.86751E-12	0	3.15426E-12	1.29038E-10	4.704E-10	0	0	3.48402E-11	0	1.7205E-10	0	0	7.16877E-11	6.40743E-11	7.99036E-09	5.87839E-12	3.72776E-10	0	2.36569E-11	2.13629E-11	2.12196E-11	
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
	Hazard Quotient	HQ	mg/kg-d					5.48891E-08										4.70021E-07								
	Total Hazard Index	HI	mg/kg-d																							
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	Water ingestion rate	IR	l/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.711175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13	
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00						
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13	6.24E-13	4.05E-15						
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Average intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.7327E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02					
	Hazard Quotient	HQ	mg/kg-d				4.467E-09		4.33179E-07					9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07						
	Total Hazard Index	HI	mg/kg-d																							
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35954262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	event duration	t <sub>event</sub>	hr																							
	absorbed dose per event	D <sub>asvent</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	
	Event frequency	EV	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	8.40E-02	7.30E+00						
	Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12	1.30E-12	1.30E-12						
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03					
Hazard Quotient	HQ	mg/kg-d				4.64479E-06		2.13966E-06					2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.34995E-06							
Total Hazard Index	HI	mg/kg-d																								
Carcinogenic risk - all routes (detected organics)																										
Carcinogenic risk - all routes (undetected organics)																										
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	5.24E-13	3.01E-12	1.49E-12	5.21E-12	1.07E-09	3.32E-09	5.30E-12	8.25E-11	2.53E-12	5.52E-13	2.68E-08	0.00E+00	7.06E-12	1.83E-11	8.94E-11	0.00E+00	1.93E-12	5.06E-08	7.89E-11	0.00E+00	3.49E-12
Non-Carcinogenic risk - all routes (detected organics)																										
Non-Carcinogenic risk - all routes (undetected organics)																										
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	5.83093E-06	0	0.000165818	0	0	0	0	2.52463E-07	1.38234E-06	1.72056E-07	2.24747E-07	0.058737811	1.34225E-08	7.91025E-06	0	1.1587E-08	2.73724E-07	3.34273E-07



TABLE 7-21  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution	
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride				
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02				
	Risk	R	fraction	0.00E+00						5.50E-11	6.63E-13	2.69E-14				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												0%	
	Average Intake from inhalation non-carcinogens	I <sub>0</sub>	mg/kg-d	0	2.1967E-10	2.65451E-09	2.84809E-10	0	0	3.05438E-10	3.8663E-10	1.04664E-11				
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02				
	Hazard Quotient	HQ	mg/kg-d			3.09744E-06	5.02292E-07			2.1817E-09	3.39149E-08	3.65958E-10				
	Total Hazard Index	HI	mg/kg-d												0%	
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	Water ingestion rate	IR	l/d													
	Exposure frequency	EF	d/y													
	Exposure duration	ED	y													
	Body weight	BW	kg													
	Averaging time carcinogens	AT <sub>c</sub>	d													
	Averaging time non-carcinogens	AT <sub>nc</sub>	d													
	Average Intake from ingestion carcinogens	I <sub>0</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11				
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01				
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	2.39E-11	9.52E-12			1%	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction													
	Average Intake from ingestion non-carcinogens	I <sub>0</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10				
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08				
	Total Hazard Index	HI	mg/kg-d												0%	
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	event duration	t <sub>event</sub>	hr													
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12				
	Event frequency	EV	events/day													
	Exposure duration	ED	y													
	Exposure frequency	EF	d/y													
	Skin surface area	SA	cm2													
	Body weight	BW	kg													
	Averaging time	AT	d/y													
	Averaging time non-carcinogens	AT <sub>nc</sub>	d													
	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01				
Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	1.72E-11	1.73E-11			3%		
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction														
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10				
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08				
	Total Hazard Index	HI	mg/kg-d												4%	
Carcinogenic risk - all routes (detected organics)														2.78E-07		
Carcinogenic risk - all routes (undetected organics)														3.49E-09		
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	2.02E-12	0.00E+00	0.00E+00	0.00E+00	2.59E-09	1.59E-11	1.52E-07	2.77E-08	1.58E-09	2.82E-07	
Non-Carcinogenic risk - all routes (detected organics)															6.47E-02	
Non-Carcinogenic risk - all routes (undetected organics)															1.97E-04	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	2.49767E-08	0.000210577	8.84096E-06	0	5.14364E-08	6.73719E-06	0.002945885	2.12347E-05	6.49E-02	



TABLE 7-22

**RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)**  
**MISSOURI ELECTRIC WORKS**

							Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3'-Dichlorobenzidine	4,4'-Dithio-2-Methyl Phenol	Aroclor-1016	Aroclor-1221			
Groundwater	Air	Indoor air	Vapour intrusion - inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00			
				POE concentration	C <sub>soil</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00			
				Inhalation rate	IR	m3/hr	0.42																				
				Exposure time	ET	h/d	24																				
				Exposure frequency	EF	d/y	350																				
				Exposure duration	ED	y	6																				
				Body weight	BW	kg	15																				
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
				Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																				
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85448E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02				2.20E-02									4.00E-01	4.00E-01
				Risk	R	fraction		8.51E-11	2.93E-10				9.65E-10				7.49E-09			0.00E+00						1.49E-12	0.00E+00
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																					0.00E+00
				Average Intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0			
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03			2.30E-01										
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05			1.72583E-05										
Total Hazard Index	HI	mg/kg-d																									
Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08			
			POE concentration	C <sub>soil</sub>	mg/m3		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08				
			Water ingestion rate	IR	l/d	1																					
			Exposure frequency	EF	d/y	350																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																					
			Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		1.21942E-12	8.04658E-14	1.6086E-10	6.68493E-12	1.07397E-11	1.41425E-13	7.5589E-14	8.9863E-11	9.91781E-11	2.54263E-12	5.7789E-13	3.50137E-12	4.67014E-11	3.91773E-12	2.51668E-12	1.21918E-13	7.07123E-14				
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00	4.50E-01			4.00E-01	4.00E-01				
			Risk	R	fraction		2.44E-13	4.59E-15				1.29E-14	5.14E-15		2.38E-12	2.80E-14	3.93E-13	2.35E-11		1.76E-12		4.88E-14	2.83E-14				
			Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
			Average Intake from Ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d		1.42266E-11	9.38767E-13	1.8767E-09	7.79909E-11	1.25297E-10	1.64995E-12	8.81872E-13	1.0484E-09	1.15708E-09	2.9664E-11	6.74205E-12	4.08493E-11	5.44849E-10	4.57048E-11	2.93613E-11	1.42237E-12	8.24977E-13				
			Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03			1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d		2.3711E-10	2.34692E-10	1.8767E-08	7.79909E-09	1.25297E-08	8.24977E-11	8.01702E-10	3.49467E-08	3.85693E-08	2.9664E-07	3.37103E-09	4.08493E-08	1.0897E-07			2.93613E-07	2.03196E-08				
			Total Hazard Index	HI	mg/kg-d																						
		Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08			
			event duration	t <sub>event</sub>	hr	1																					
			absorbed dose per event	D <sub>abs</sub>	mg/cm2-event		4.11711E-15	2.01787E-16	3.48361E-13	1.63529E-14	3.7841E-13	1.9079E-16	2.00333E-16	2.21213E-12	1.77045E-12	5.18524E-14	9.56334E-16	0	1.40816E-13	4.23395E-14	4.61624E-15	0	5.51565E-15				
			Event frequency	EV	events/day	1																					
			Exposure duration	ED	y	6																					
			Exposure frequency	EF	d/y	350																					
			Skin surface area	SA	cm2	6,600																					
			Body weight	BW	kg	15																					
			Averaging time	AT	d/y	25,550																					
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																					
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.48893E-13	7.2975E-15	1.25983E-11	5.91393E-13	1.3685E-11	6.89979E-15	7.2449E-15	8.00005E-11	6.40271E-11	1.87521E-12	3.45852E-14	0	5.09251E-12	1.53118E-12	1.66944E-13	0	1.9947E-13				
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00	4.50E-01			4.00E-01	4.00E-01				
			Risk	R	fraction		2.98E-14	4.16E-16				6.28E-16	4.93E-16		1.54E-12	2.06E-14	2.77E-14	0.00E+00		6.89E-13		0.00E+00	7.98E-14				
			Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
			Absorbed dose for non-carcinogens	DAD <sub>n</sub>	mg/kg-d		1.73708E-12	8.51374E-14	1.4698E-10	6.89958E-12	1.59658E-10	8.04975E-14	8.45239E-14	9.33339E-10	7.46983E-10	2.18775E-11	4.03494E-13	0	5.94126E-11	1.78638E-11	1.94768E-12	0	2.32715E-12				
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03			1.00E-04	7.00E-05				
Hazard Quotient	HQ	mg/kg-d		2.89514E-11	2.12844E-11	1.4698E-09	6.89958E-10	1.59658E-08	4.02488E-12	7.68399E-11	3.11113E-08	2.48994E-08	2.18775E-07	2.01747E-10	0	1.18825E-08	1.94768E-08	0									
Total Hazard Index	HI	mg/kg-d																									
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l			2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08			
			Concentration in tap water	C <sub>soil</sub>	mg/m3		2.22545E-07	1.4685E-08	0.000029357	0.00000122	0.00000196	2.581E-08	1.3795E-08	0.0000164	0.0000181	4.6403E-07	1.05465E-07	0.000000639	0.000008523	7.14985E-07	4.59295E-07	2.225E-08	1.2905E-08				
			Volatilization factor	VF	dimensionless	0.0005																					
			POE concentration	C <sub>air</sub>	mg/m3		1.11273E-10	7.3425E-12	1.46785E-08	6.1E-10	9.8E-10	1.2905E-11	6.8975E-12	8.2E-09	9.05E-09	0	0	0	4.2615E-09	0	0	1.1125E-11	0				
			Inhalation rate	IR	m3/hr	0.42																					
			Exposure time	ET	h/d	24																					
			Exposure frequency	EF	d/y	350																					
			Exposure duration	ED	y	6																					
			Body weight	BW	kg	15																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>n</sub>	d	2,190																					
			Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		6.1459E-12	4.05547E-13	8.10736E-10	3.36921E-11	5.41282E-11	7.1278E-13	3.80969E-13	4.5291E-10	4.99858E-10	0	0	0	2.35375E-10	0	0	6.14446E-13					



TABLE 7-22  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Araclo-1222	Araclo-1242	Araclo-1248	Araclo-1254	Araclo-1260 (Filled)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
Vapour Intrusion - Inhalation	POE concentration	$C_{inh}$	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06	
	POE concentration	$C_{inh}$	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09	
	Inhalation rate	IR	m3/hr																							
	Exposure time	ET	h/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	$AT_c$	d																							
	Averaging time non-carcinogens	$AT_n$	d																							
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87743E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11	
Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00		
Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10		
Total carcinogenic risk for exposure route	$R_t$	fraction																								
Average Intake from Inhalation non-carcinogens	$I_n$	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10		
Inhalation Reference Dose	$RD_{inh}$	mg/kg-d						8.57E-03																		
Hazard Quotient	HQ	mg/kg-d						0.000163164																		
Total Hazard Index	HI	mg/kg-d																								
Ingestion of tap water	POE concentration	$C_w$	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08	
	POE concentration	$C_w$	mg/m3	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08	
	Water Ingestion rate	IR	l/d																							
	Exposure time	ET	d/y																							
	Exposure frequency	EF	y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	$AT_c$	d																							
	Averaging time non-carcinogens	$AT_n$	d																							
	Average Intake from Ingestion carcinogens	$I_c$	mg/kg-d	8.53425E-14	4.87671E-14	3.16986E-14	5.36438E-14	2.19452E-12	8E-12	3.46247E-13	3.21863E-13	5.92521E-13	3.4137E-13	2.92403E-12	4.24274E-13	5.85205E-11	1.21918E-12	1.0897E-12	1.5859E-10	9.99726E-14	6.33973E-12	3.16986E-13	4.02329E-13	3.63315E-13	3.60877E-13	
Ingestion Cancer Slope Factor	$CSF_o$	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-01	1.10E+00				6.20E-02			1.30E-01			7.80E-02	1.60E+00		
Risk	R	fraction	3.41E-14	1.95E-14	1.27E-14	2.15E-14	8.78E-13	4.40E-13	2.53E-13	2.35E-12	4.33E-13	2.49E-14	3.22E-12				8.19E-13			7.56E-14			2.83E-14	5.77E-13		
Total carcinogenic risk for exposure route	$R_t$	fraction																								
Average Intake from Ingestion non-carcinogens	$I_n$	mg/kg-d	9.95662E-13	5.6895E-13	3.69817E-13	6.25845E-13	2.56027E-11	9.33333E-11	4.03954E-12	3.75807E-12	6.91274E-12	3.98265E-12	3.4137E-11	4.94984E-12	6.8274E-10	1.42237E-11	1.27132E-11	1.58539E-09	1.16635E-12	7.39635E-11	3.69817E-12	4.69384E-12	4.23848E-12	4.21023E-12		
Ingestion Reference Dose	$RD_{ing}$	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02			4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d				3.12922E-08		2.33333E-08						1.23747E-10	3.4137E-08	7.11187E-10	1.81616E-08	7.92694E-08	5.83174E-11	7.39635E-09		1.17346E-09	2.11934E-08	5.26279E-09		
Total Hazard Index	HI	mg/kg-d																								
Dermal contact with tap water	POE concentration	$C_w$	ug/l	1.5575E-08	8.9E-09	5.785E-09	9.79E-09	4.005E-07	0.00000146	6.319E-08	5.874E-08	1.08135E-07	6.23E-08	0.000000534	7.743E-08	0.00001068	2.225E-07	1.9887E-07	0.0000248	1.8245E-08	0.000001157	5.785E-08	7.3425E-08	6.6305E-08	6.586E-08	
	event duration	$t_{event}$	hr																							
	absorbed dose per event	$D_{event}$	mg/cm2-event	6.65682E-15	2.91121E-14	2.02991E-14	5.4531E-14	1.39319E-11	3.39713E-14	1.16957E-13	1.86397E-13	3.48205E-13	1.97746E-13	2.15545E-15	1.09605E-14	2.40168E-12	2.67075E-15	7.90178E-15	1.30574E-12	2.03529E-16	1.53981E-14	2.85093E-13	1.92826E-14	2.34778E-14	4.49388E-14	
	Event frequency	EF	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	$AT_n$	d																							
Absorbed dose for carcinogens	$DAD_c$	mg/kg-d	2.4074E-13	1.05282E-12	7.34104E-13	1.97208E-12	5.03899E-10	1.22855E-12	4.22947E-12	6.74093E-12	1.29926E-11	7.15136E-12	7.79505E-14	3.96379E-13	8.68552E-11	9.6584E-14	2.85743E-13	4.72213E-11	7.3605E-15	5.56864E-13	1.03102E-11	6.97342E-13				



TABLE 7-22  
RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	8.28E-09	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										3.35E-07		96%
	Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.7720E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02999E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										2.35E-05		95%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	POE concentration	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	3.4137E-13	3.73589E-12	4.51447E-11	4.8777E-12	3.95014E-12	2.20427E-12	5.19452E-12	6.57534E-12	1.78E-13			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R	fraction	2.49E-13				2.77E-11	2.65E-13	2.81E-12	3.95E-14	1.28E-13			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										7.12E-11		0%
	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.98265E-12	4.35854E-11	5.26688E-10	5.69065E-11	4.60849E-11	2.57165E-11	6.06027E-11	7.67123E-11	2.07667E-12			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d			4.00E-03	2.00E-02	5.00E-04	3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d			1.08963E-08	2.63344E-08	1.13813E-07	8.57218E-10	6.06027E-09	2.55708E-07	6.92222E-10			
	Total Hazard Index	HI	mg/kg-d										1.61E-07		0%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	2.0906E-13	0	7.92888E-13	9.58085E-15	3.5181E-15	7.12178E-13	8.33888E-14	2.94245E-14	2.67062E-16			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	7.54054E-12	0	2.86743E-11	3.46485E-13	1.2723E-13	2.57555E-11	3.0157E-12	1.06412E-12	9.65812E-15			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01			
	Risk	R	fraction	1.74E-12				2.29E-13	3.09E-12	1.63E-12	9.58E-16	6.95E-15			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										3.09E-10		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	8.82063E-11	0	3.34534E-10	4.04233E-12	1.48435E-12	3.0048E-10	3.51832E-11	1.24147E-11	1.12678E-13			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d			4.00E-03	2.00E-02	5.00E-04	3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d			0	1.67267E-08	8.08466E-09	1.0016E-08	3.51832E-09	2.75883E-07	3.75594E-11			
	Total Hazard Index	HI	mg/kg-d										2.23E-06		0%
Vapors from tap water not those with a "Y"	Concentration in tap water	C <sub>w</sub>	ug/l	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Concentration in tap water	C <sub>w</sub>	mg/m3	6.23E-08	6.818E-07	8.2389E-06	8.9018E-07	7.209E-07	4.0228E-07	0.000000948	0.0000012	3.2485E-08			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air-top</sub>	mg/m3	0	3.409E-10	4.11945E-09	4.4509E-10	0	0	4.74E-10	6E-10	1.62425E-11			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.88289E-11	2.27529E-10	2.45836E-11	0	0	2.61804E-11	3.31397E-11	8.9712E-13			



TABLE 7-22  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,5-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		1.25E-12	2.31E-14				6.49E-14			1.10E-11	0.00E+00							2.46E-13	0.00E+00
				Total carcinogenic risk for exposure route																					
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		7.17022E-11	4.73139E-12	9.45858E-09	3.93074E-10	6.31496E-10	8.31577E-12	4.44444E-12	5.28395E-09	5.83167E-09	0	0	0	2.74404E-09	0	0	7.16877E-12	0	
				Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01									
				Hazard Quotient	HQ	mg/kg-d						5.53944E-07	5.93984E-09	3.8988E-09		2.53551E-08									
				Total Hazard Index	HI	mg/kg-d																			
				POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				POE concentration	C <sub>w</sub>	mg/m3		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				Water ingestion rate	IR	l/d	0.05																		
				Exposure frequency	EF	d/y	52																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15	
				Total carcinogenic risk for exposure route																					
				Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22426E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13	
				Ingestion Reference Dose	RTD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09		
Total Hazard Index	HI	mg/kg-d																							
				POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07	
				event duration	t <sub>event</sub>	hr	2																		
				absorbed dose per event	D <sub>abs</sub>	mg/cm2-event	1	1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13	
				Event frequency	EV	events/day	1																		
				Exposure duration	ED	y	6																		
				Exposure frequency	EF	d/y	52																		
				Skin surface area	SA	cm2	6,600																		
				Body weight	BW	kg	15																		
				Averaging time	AT	d/y	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
								Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
Risk	R <sub>i</sub>	fraction						1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.04E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	
Total carcinogenic risk for exposure route																									
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d						6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93645E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12	
Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d						1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76099E-07	0.000112745	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0		
Total Hazard Index	HI	mg/kg-d																							
Carcinogenic risk - all routes (detected organics)																									
Carcinogenic risk - all routes (undetected organics)																									
TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum Ri	fraction						8.80E-11	2.94E-10	0.00E+00	0.00E+00	0.00E+00	9.68E-10	1.52E-12	0.00E+00	1.39E-08	8.39E-13	8.78E-11	5.38E-11	0.00E+00	2.99E-11	0.00E+00	1.80E-12	4.34E-13	
Non-Carcinogenic risk - all routes (detected organics)																									
Non-Carcinogenic risk - all routes (undetected organics)																									
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum Hi	fraction		1.6307E-09	6.47029E-08	1.03527E-07	3.00821E-05	0.002318458	8.83941E-05	6.01548E-05	0.00011722	0.000120823	8.89532E-06	6.78207E-07	9.36566E-08	7.20706E-07	0	1.40443E-06	2.32205E-08	0					

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-22  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz[a]anthracene	Benz[a]pyrene	Benz[b]fluoranthene	Benz[k]fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis(2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz[a,h]Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
Incidental ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00					5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00
	Risk	R	fraction	0.00E+00	9.83E-14	0.00E+00	1.08E-13	4.42E-12	1.10E-12	0.00E+00	0.00E+00	9.20E-13	0.00E+00	1.71E-11					2.86E-13			2.59E-12	0.00E+00		1.41E-13	2.93E-12
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Average intake from inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.86751E-12	0	3.15426E-12	1.29038E-10	4.704E-10	0	0	3.48402E-11	0	1.7205E-10	0	0	7.16877E-11	6.40743E-11	7.99034E-09	5.87839E-12	3.72776E-10	0	2.36569E-11	2.13629E-11	2.12196E-11	
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Incidental ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					5.48891E-08											4.70021E-07							
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00442E-06	
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00442E-06	
	Water Ingestion rate	IR	l/d																							
Incidental ingestion of creek water	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>h</sub>	d																							
Incidental ingestion of creek water	Average intake from ingestion carcinogens	I <sub>h</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13	
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
	Risk	R	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13		1.45E-15		4.05E-15	2.61E-13	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Average intake from ingestion non-carcinogens	I <sub>h</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.6841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d					2.00E-05							4.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04		
	Hazard Quotient	HQ	mg/kg-d					4.467E-09							9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09	
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00442E-06	
	event duration	tevent	hr																							
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	
	Event frequency	EF	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
Dermal contact with creek water	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>h</sub>	d																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
Dermal contact with creek water	Risk	R	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12		2.67E-13	3.32E-11	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Absorbed dose for non-carcinogens	DAD <sub>non</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d					2.00E-05							4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04	
	Hazard Quotient	HQ	mg/kg-d					4.64479E-06							2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99777E-07	3.02932E-07	
Dermal contact with creek water	Total Hazard Index	HI	mg/kg-d																							
	Carcinogenic risk - all routes (detected organics)		fraction																							
	Carcinogenic risk - all routes (undetected organics)		fraction																							
	TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>t</sub>	fraction	5.24E-13	3.01E-12	1.49E-12	5.21E-12	1.07E-09	3.32E-09	5.30E-12	8.25E-11	2.53E-12	5.56E-13	2.68E-08	0.00E+00	7.06E-12	1.83E-11	8.94E-11	0.00E+00	1.93E-12	5.06E-08	7.89E-11	0.00E+00	3.69E-12	1.48E-10	
	Non-Carcinogenic risk - all routes (detected organics)		fraction																							
Non-Carcinogenic risk - all routes (undetected organics)		fraction																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum HI	fraction	0	0	0	5.83093E-06	0	0.000165818	0	0	0	0	0	0	2.52463E-07	1.38234E-06	1.72056E-07	2.24747E-07	0.058737811	1.34225E-08	7.91025E-06	0	1.1587E-08	2.73724E-07	3.34273E-07	



TABLE 7-22  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL C)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						5.50E-11	1.99E-13	2.69E-14			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												0%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.1967E-10	2.65451E-09	2.86809E-10	0	0	3.05438E-10	3.8663E-10	1.04664E-11			
	Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			3.09744E-06	5.02292E-07			2.1817E-09	3.39149E-08	3.65958E-10			
	Total Hazard Index	HI	mg/kg-d											4.9E-06	0%
Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	7.16E-12	9.52E-12			1%
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RTD <sub>g</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d											9.92E-06	0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	5.16E-12	1.73E-11			3%
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											6.17E-09	
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d											2.84E-05	4%
	Carcinogenic risk - all routes (detected organics)													2.59E-07	
	Carcinogenic risk - all routes (undetected organics)													3.49E-09	
	TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>t</sub>	fraction	2.02E-12	0.00E+00	0.00E+00	0.00E+00	2.59E-09	1.59E-11	1.52E-07	8.30E-09	1.58E-09		2.62E-07	
	Non-Carcinogenic risk - all routes (detected organics)													6.47E-02	
	Non-Carcinogenic risk - all routes (undetected organics)													1.97E-04	
	TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum HI	fraction	0	2.49767E-08	0.000210577	8.84096E-06	0	5.14364E-08	6.73719E-06	0.002945885	2.12347E-05		6.49E-02	



TABLE 7-23

**RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)**  
**MISSOURI ELECTRIC WORKS**

							Chemicals of Potential Concern																			
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-methyl Phenol	Aroclor-1016	Aroclor-1221		
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>inh</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.89E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00		
				POE concentration	C <sub>inh</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00		
				Inhalation rate	IR	m3/hr	0.42																			
				Exposure time	ET	h/d	24																			
				Exposure frequency	EF	d/y	350																			
				Exposure duration	ED	y	6																			
				Body weight	BW	kg	15																			
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																			
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																			
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0		
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02		1.09E-02									4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		8.51E-11	2.93E-10				9.65E-10		7.49E-09									1.49E-12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																				
				Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0		
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01										
Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05														
Total Hazard Index	HI	mg/kg-d																								
Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282		
			POE concentration	C <sub>w</sub>	mg/m3			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282		
			Water Ingestion rate	IR	l/d	1																				
			Exposure frequency	EF	d/y	350																				
			Exposure duration	ED	y	6																				
			Body weight	BW	kg	15																				
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																				
			Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		5.07342E-07	8.46247E-07	6.6926E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	1.05786E-06	6.07759E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	1.25479E-06	7.27781E-07			
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R <sub>i</sub>	fraction		1.01E-07	4.82E-08				1.35E-07	5.41E-08		6.53E-06	1.16E-08	4.13E-06	9.77E-06		7.33E-07		5.02E-07	2.91E-07			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
			Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.919E-06	9.87288E-06	0.000780804	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	1.23417E-05	7.09052E-05	1.70046E-05	0.000226685	1.90163E-05	1.22158E-05	1.46393E-05	8.49078E-06			
			Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-02	1.00E-04	2.00E-03	5.00E-03		1.00E-03	1.00E-04	7.00E-05	7.00E-05			
			Hazard Quotient	HQ	mg/kg-d		9.86499E-05	0.002468219	0.007808037	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.123417352	0.035452603	0.017004566	0.045336986		0.122157991	0.20913242				
Total Hazard Index	HI	mg/kg-d																								
		Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282		
			event duration	t <sub>event</sub>	hr	1																				
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event		1.71293E-09	2.12216E-09	1.44936E-07	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	2.15732E-08	1.00576E-08		5.85864E-08	1.76154E-08	1.92059E-09		0	5.67678E-08		
			Event frequency	EF	events/day	1																				
			Exposure duration	ED	y	6																				
			Exposure frequency	EF	d/y	350																				
			Skin surface area	SA	cm2	6,600																				
			Body weight	BW	kg	15																				
			Averaging time	AT	d/y	25,550																				
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																				
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		6.19469E-08	7.67467E-08	5.24152E-06	5.31769E-06	0.000422559	7.25641E-08	7.61934E-08	0.000214587	0.000175526	7.80182E-07	3.63728E-07		0	2.11874E-06	6.37049E-07	6.9457E-08	0	2.05297E-06		
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R <sub>i</sub>	fraction		1.24E-08	4.37E-09				6.60E-09	5.18E-09		4.21E-06	8.58E-09	2.91E-07	0.00E+00		2.87E-07		0.00E+00	8.21E-07			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		7.22714E-07	8.95378E-07	6.1151E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	9.10213E-06	4.24349E-06		0	2.47186E-05	7.43224E-06	8.10332E-07	0	2.39513E-05		
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-02	1.00E-04	2.00E-03		1.00E-03	5.00E-03		1.00E-04	7.00E-05						
Hazard Quotient	HQ	mg/kg-d		1.20452E-05	0.000223845	0.00061151	0.006203967	0.492985057	4.23229E-05	0.000808114	0.083450362	0.068260247	0.091021282	0.002121746		0	0.004943729		0.008103318	0						
Total Hazard Index	HI	mg/kg-d																								
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282		
			Concentration in tap water	C <sub>w</sub>	mg/m3			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282		
			Volatilization factor	VF	dimensionless	0.0005 y																				
			POE concentration	C <sub>air-top</sub>	mg/m3		0.000046295	0.00007722	0.006107	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.001773	0	0	0.0001145	0			
			Inhalation rate	IR	m3/hr	0.42																				
			Exposure time	ET	h/d	24																				
			Exposure frequency	EF	d/y	350																				
			Exposure duration	ED	y	6																				
			Body weight	BW	kg	15																				
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																				
			Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		2.55701E-06	4.26508E-06	0.000337307	0.000302952	0.001671347	7.49621E-06	4.00659E-06	0.001214847	0.001370328	0	0	0	9.79279E-05	0	0	6.32416E-06	0			



TABLE 7-23

**RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)**  
**MISSOURI ELECTRIC WORKS**

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Acrolein-1232	Acrolein-1242	Acrolein-1248	Acrolein-1254	Acrolein-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl phosphide)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-butadiene	Hexachlorobenzene	
Vapour intrusion - Inhalation	POE concentration	C <sub>inh</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>inh</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																							
	Exposure time	ET	h/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00		0	0	5.20E-02	5.20E-02	8.10E-02	3.08E-01			7.70E-02	1.61E+00	
Risk	R <sub>i</sub>	fraction		0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11	8.73E-11	5.04E-08	0.00E+00			3.18E-12	1.07E-10	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																								
Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d							8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d							0.000163164										0.057615471							
Total Hazard Index	HI	mg/kg-d																								
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Water ingestion rate	IR	l/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		8.78356E-07	5.01918E-07	3.26247E-07	5.5211E-07	2.25863E-05	0.000414959	3.56362E-06	3.31266E-06	5.05307E-06	2.91123E-06	3.07726E-05	4.46203E-06	0.000602301	1.28219E-05	4.5337E-07	0.015896877	1.0514E-06	6.6674E-05	2.70329E-06	4.14082E-06	3.73929E-06	3.71419E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	1.30E-01	8.40E-02	7.30E+00	6.10E+00	7.80E-02	1.60E+00	
Risk	R <sub>i</sub>	fraction		3.51E-07	2.01E-07	1.30E-07	2.21E-07	9.03E-06	2.28E-05	2.60E-06	2.42E-05	3.69E-06	2.13E-07	3.38E-05		8.43E-06	7.95E-07	5.89E-08	8.83E-08		1.97E-05			2.92E-07	5.94E-06	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																								
Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.02475E-05	5.85571E-06	3.80421E-06	6.44128E-06	0.000263507	0.004841187	4.15735E-05	3.86477E-05	5.89525E-05	3.39644E-05	0.000359014	5.2057E-05	0.007026849	0.000149589	5.28932E-06	0.185463562	1.22663E-05	0.000777863	3.15384E-05	4.83096E-05	4.3625E-05	4.33322E-05	
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02			4.00E-03	2.00E-04	
Hazard Quotient	HQ	mg/kg-d					0.322063927		1.210296804						0.001301425	0.351342466	0.007479452	0.007556164	9.273178082	0.000613315	0.077786301		0.012077397	0.218125114	0.054165297	
Total Hazard Index	HI	mg/kg-d																								
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	event duration	C <sub>w</sub>	hr																							
	absorbed dose per event	D <sub>der</sub>	mg/cm2-event		6.85129E-08	2.99626E-07	2.08921E-07	5.6124E-07	0.000143389	1.76209E-06	1.20373E-06	1.91842E-06	2.96952E-06	1.6864E-06	2.26685E-08	1.1527E-07	2.47184E-05	2.80879E-08	3.28754E-09	0.000152749	2.14049E-09	1.6194E-07	2.4313E-06	1.98459E-07	2.41637E-07	4.62517E-07
	Event frequency	EV	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		2.47773E-06	1.08358E-05	7.5555E-06	2.02969E-05	0.00518558	6.37248E-05	4.36323E-05	6.93786E-05	0.000107391	6.09875E-05	8.19794E-07	4.16866E-06	0.000893926	1.01578E-06	1.18892E-07	0.0035324088	7.74093E-08	5.85645E-06	8.79266E-05	7.17714E-06	8.73644E-06	1.67266E-05	
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01	1.30E-01	8.40E-02	7.30E+00	6.10E+00	7.80E-02	1.60E+00		
Risk	R <sub>i</sub>	fraction		9.91E-07	4.33E-06	3.02E-06	8.12E-06	2.07E-03	3.50E-06	1.02E-05	1.63E-04	2.47E-06	4.45E-06	9.02E-07		1.25E-05	6.30E-08	1.55E-08	6.50E-09		6.42E-08			6.82E-07	2.68E-05	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																								
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		2.89068E-05	0.000126418	8.81475E-05	0.000236797	0.060498432	0.000743456	0.000507877	0.000809417	0.001252895	0.00071152	9.56426E-06	4.86343E-05	0.010429134	1.18508E-05	1.38707E-06	0.064447698	9.03109E-07	6.83253E-05	0.00102581	8.37333E-05	0.000101951	0.000195144	
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d					11.83985998		0.185863921						0.001215858	2.744508883	0.000592539	0.001981533	10.39479003	4.51554E-05	0.034162651		0.020933313	0.509753746	0.24392995	
Total Hazard Index	HI	mg/kg-d																								
Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Volatilization factor	VF	dimensionless																							
	POE concentration	C <sub>inh</sub>	mg/m3	0	0.0000458	0	0.00005038	0.002061	0.037865	0	0	0.000461093	0	0.002808	0	0	0	0.00117	0.00004137	1.45059	0.00009594	0.006084	0	0.00037785	0.00034121	0.00033892
	Inhalation rate	IR	m3/hr																							
	Exposure time	ET	h/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
Averaging time non-carcinogens	AT <sub>nc</sub>	d																								



TABLE 7-23  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	5.52E-07	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										7.98E-06		0%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-06			6.02995E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										6.19E-02		0%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	POE concentration	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.91123E-06	1.55452E-06	1.87825E-05	2.02937E-06	4.1543E-05	2.26867E-05	2.95342E-05	8.35616E-05	0.000001872			
	Ingestion Cancer Slope Factor	CSF <sub>ing</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01			
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	3.34E-05	1.35E-06			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										6.01E-06		11%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.39644E-05	1.81361E-05	0.000219129	2.3676E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184			
	Ingestion Reference Dose	RfD <sub>ing</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0.004534018	0.010956438	0.047351963		0.0088226	0.034456621	3.249619482	0.00728			
	Total Hazard Index	HI	mg/kg-d										1.61E-01		13%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.78289E-06	0	3.29882E-07	3.98612E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	6.4477E-05	0	1.193E-05	1.44156E-07	1.33806E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01			
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	8.11E-07	7.31E-08			
	Total carcinogenic risk for exposure route	R <sub>c</sub>	fraction										3.02E-03		69%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000752231	0	0.000139183	1.68181E-06	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	0.006959146	0.003363629		0.103086176	0.020003964	3.504007297	0.000395006			
	Total Hazard Index	HI	mg/kg-d										3.04E+01		25%
Vapors from tap water not those with a "Y"	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air</sub>	mg/m3	0	0.00014185	0.0017139	0.00018518	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	7.83478E-06	9.46636E-05	1.0228E-05	0	0	0.000148853	0.000421151	9.43488E-06			



TABLE 7-23  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01			
				Risk	R	fraction		5.19E-07	2.43E-07				6.82E-07			3.01E-05	0.00E+00						2.53E-06	0.00E+00			
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
				Average intake from inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		2.98317E-05	4.97593E-05	0.00393525	0.00353444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.015987156	0	0	0	0.001142492	0	0	7.37819E-05	0			
				Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01											
				Hazard Quotient	HQ	mg/kg-d					17.10442682	0.042468384	0.041003143		0.069509375												
				Total Hazard Index	HI	mg/kg-d																					
Surface Water	Creek	Incidental Ingestion of creek water	POE concentration	C <sub>sw</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			POE concentration	C <sub>sw</sub>	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			Water ingestion rate	IR	l/d		0.05																				
			Exposure frequency	EF	d/y		52																				
			Exposure duration	ED	y		6																				
			Body weight	BW	kg		15																				
			Averaging time carcinogens	AT <sub>c</sub>	d		25,550																				
			Averaging time non-carcinogens	AT <sub>nc</sub>	d		2,190																				
			Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d			1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.26583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.06286E-12	3.2523E-12	1.74052E-14	1.00943E-14			
			Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction			3.15E-13	3.41E-13				9.54E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.94E-15	4.04E-15			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Average intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d			1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13			
			Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d			3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09				
			Total Hazard Index	HI	mg/kg-d																						
		Dermal contact with creek water	POE concentration	C <sub>sw</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07			
			event duration	t <sub>event</sub>	hr		2																				
			absorbed dose per event	D <sub>abs</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13			
			Event frequency	EF	events/day		1																				
			Exposure duration	ED	y		6																				
			Exposure frequency	EF	d/y		52																				
			Skin surface area	SA	cm2		6,600																				
			Body weight	BW	kg		15																				
			Averaging time	AT	d/y		25,550																				
			Averaging time non-carcinogens	AT <sub>nc</sub>	d		2,190																				
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			5.44227E-12	1.61158E-11	5.04038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13			
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01			
			Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13			
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12			
			Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0				
			Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																											
Carcinogenic risk - all routes (undetected organics)																											
TOTAL CARCINOGENIC RISK - ALL ROUTES							Sum R <sub>t</sub>	fraction	6.33E-07	2.96E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	2.02E-08	4.42E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	3.03E-06	1.11E-06		
Non-Carcinogenic risk - all routes (detected organics)																											
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES							Sum HI	fraction	0.000110697	0.002692128	0.00841963	0.076361895	17.9866156	0.063446717	0.050302792	0.177305719	0.243625516	0.214447013	0.037575024	0.017004619	0.050281315	0	0.1302624	0.209132423	0		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-23  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

			Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
Incidental ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00	
	Risk	R	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04				1.19E-07			2.72E-05	0.00E+00		1.45E-06	3.01E-05	
	Total carcinogenic risk for exposure route	R <sub>t</sub>																							
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	0	2.95128E-05	0	3.2464E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	2.66581E-05	0.934736351	6.18222E-05	0.00392043	0	0.00024348	0.00021987	0.000218394	
	Inhalation Reference Dose	RTD <sub>inh</sub>						8.57E-03									1.70E-02								
Dermal contact with creek water	Hazard Quotient	HQ					2.847092598										54.98449122								
	Total Hazard Index	HI																							
	POE concentration	C <sub>w</sub>	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	POE concentration	C <sub>w</sub>	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	Water ingestion rate	IR																							
Incidental ingestion of creek water	Exposure frequency	EF																							
	Exposure duration	ED																							
	Body weight	BW																							
	Averaging time carcinogens	AT <sub>c</sub>																							
	Averaging time non-carcinogens	AT <sub>nc</sub>																							
Dermal contact with creek water	Average Intake from ingestion carcinogens	I <sub>g</sub>	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43004E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13	
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
	Risk	R	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.83E-13		6.24E-13		1.45E-15		4.05E-15	2.61E-13	
	Total carcinogenic risk for exposure route	R <sub>t</sub>																							
	Average Intake from ingestion non-carcinogens	I <sub>g</sub>	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	
Dermal contact with creek water	Ingestion Reference Dose	RTD <sub>g</sub>					2.00E-05	4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
	Hazard Quotient	HQ					4.467E-09	4.33179E-07						9.19497E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07		1.67513E-10	3.02538E-09	2.37824E-09	
	Total Hazard Index	HI																							
	POE concentration	C <sub>w</sub>	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	event duration	t <sub>event</sub>																							
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub>	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	
	Event frequency	EF																							
	Exposure duration	ED																							
	Exposure frequency	EF																							
	Skin surface area	SA																							
Dermal contact with creek water	Body weight	BW																							
	Averaging time	AT																							
	Averaging time non-carcinogens	AT <sub>nc</sub>																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
Dermal contact with creek water	Risk	R	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12		2.67E-13	3.32E-11	
	Total carcinogenic risk for exposure route	R <sub>t</sub>																							
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72104E-09	4.09136E-09	2.36848E-09	1.24844E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	
	Dermal Reference Dose	RTD <sub>der</sub>					2.00E-05	4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04	
	Hazard Quotient	HQ					4.64479E-06	2.13966E-06						2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06		8.21216E-09	1.99977E-07	3.02932E-07	
Dermal contact with creek water	Total Hazard Index	HI																							
	Carcinogenic risk - all routes (detected organics)																								
	Carcinogenic risk - all routes (undetected organics)																								
	TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>t</sub>	fraction	1.34E-06	5.55E-06	3.15E-06	9.45E-06	2.13E-03	8.34E-05	1.28E-05	1.87E-04	1.40E-05	4.66E-06	2.15E-04	0.00E+00	2.09E-05	8.58E-07	1.93E-07	0.00E+00	9.48E-08	2.73E-05	6.62E-04	0.00E+00	2.42E-06	6.28E-05
	Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																									
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum H <sub>i</sub>	fraction	0	0	0	12.16192855	0	4.243419059	0	0	0	0	0	0.002517535	3.09585243	0.008072162	0.009537899	74.7111965	0.000658484	0.111956852	0	0.033010719	0.727879063	0.298095552	



TABLE 7-23  
RME RISK CALCULATIONS FOR CHILD RESIDENT (HIGH TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylhopthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg fraction	3.08E+01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	1.68E-04	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction												20%
	Average intake from inhalation non-carcinogens	I <sub>0</sub>	mg/kg-d	0	9.14058E-05	0.001104409	0.000119327	0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RTD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			1.288691933	0.208978893			0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d												62%
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>0</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg fraction	7.30E-01				7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	4.78E-10	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction												0%
	Average intake from ingestion non-carcinogens	I <sub>0</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80436E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RTD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d												0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	2.49889E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg fraction	2.30E-01				1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	3.44E-10	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction												0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.98389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RTD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d												0%
Carcinogenic risk - all routes (detected organics)														3.35E-03	
Carcinogenic risk - all routes (undetected organics)														1.03E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES														4.39E-03	
Non-Carcinogenic risk - all routes (detected organics)														1.09E-02	
Non-Carcinogenic risk - all routes (undetected organics)														1.41E-01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES														1.24E+02	
				Sum Ri	fraction	1.76E-03	0.00E+00	0.00E+00	0.00E+00	2.93E-04	3.45E-05	3.38E-04	2.03E-04	1.71E-06	
				Sum HI	fraction	0	0.004534032	1.306814953	0.259702702	0	0.111908816	0.066871694	7.189574261	0.011544967	



TABLE 7-24  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221	
Groundwater	Air	Indoor air	Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00	
				POE concentration	C <sub>air</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.04047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0	
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		8.51E-11	2.93E-10				9.65E-10			7.49E-09	0.00E+00						1.49E-12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0	
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01									
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05		1.72583E-05									
				Total Hazard Index	HI	mg/kg-d																			
Groundwater	Tap Water	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
				POE concentration	C <sub>w</sub>	mg/m3		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
				Water ingestion rate	IR	l/d	1																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																		
				Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d		5.07342E-07	8.46247E-07	6.6926E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	1.05786E-06	6.07759E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	1.25479E-06	7.27781E-07	
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		1.01E-07	4.82E-08				1.35E-07	5.41E-08		6.53E-06	1.16E-08	4.13E-06	9.77E-06		7.33E-07		5.02E-07	2.91E-07	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																			
				Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		5.919E-06	9.87288E-06	0.000780804	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	1.23417E-05	7.09052E-05	1.70046E-05	0.000226685	1.90163E-05	1.22158E-05	1.46393E-05	8.49078E-06	
				Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
				Hazard Quotient	HQ	mg/kg-d		9.86499E-05	0.002468219	0.007808037	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.123417352	0.035452603	0.017004566	0.045336986		0.122157991	0.20913242		
				Total Hazard Index	HI	mg/kg-d																			
							Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747
event duration	t <sub>event</sub>	hr	1																						
absorbed dose per event	D <sub>abs</sub>	mg/cm2-event						1.71293E-09	2.12216E-09	1.44936E-07	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	2.15732E-08	1.00576E-08	0	5.85864E-08	1.76154E-08	1.92059E-09	0	5.67678E-08	
Event frequency	EV	events/day	1																						
Exposure duration	ED	y	6																						
Exposure frequency	EF	d/y	350																						
Skin surface area	SA	cm2	6,600																						
Body weight	BW	kg	15																						
Averaging time	AT	d/y	25,550																						
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d						6.19449E-08	7.67467E-08	5.24152E-06	5.31769E-06	0.000422559	7.25641E-08	7.61936E-08	0.000214587	0.000175526	7.80182E-07	3.63728E-07	0	2.11874E-06	6.37049E-07	6.9457E-08	0	2.05297E-06	
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
Risk	R <sub>i</sub>	fraction						1.24E-08	4.37E-09				6.60E-09	5.18E-09		4.21E-06	8.58E-09	2.91E-07	0.00E+00		2.87E-07		0.00E+00	8.21E-07	
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d						7.22714E-07	8.95378E-07	6.1151E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	9.10213E-06	4.24349E-06	0	2.47184E-05	7.43224E-06	8.10332E-07	0	2.39513E-05	
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05		
Hazard Quotient	HQ	mg/kg-d						1.20452E-05	0.000223845	0.00061151	0.006203967	0.492985057	4.2329E-05	0.000808114	0.083450362	0.068260247	0.091021282	0.002121746	0	0.004943729		0.008103318	0		
Total Hazard Index	HI	mg/kg-d																							
Air	Indoor Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
				Concentration in tap water	C <sub>w</sub>	mg/m3		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
				Volatilization factor	VF	dimensionless	0.0005 y																		
				POE concentration	C <sub>air</sub>	mg/m3		0.000046295	0.00007722	0.006107	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.001773	0	0	0.0001145	0	
				Inhalation rate	IR	m3/hr	0.42																		
				Exposure time	ET	h/d	24																		
				Exposure frequency	EF	d/y	350																		
				Exposure duration	ED	y	6																		
				Body weight	BW	kg	15																		
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																		
				Averaging time non-carcinogens	AT																				



TABLE 7-24

**RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)**  
**MISSOURI ELECTRIC WORKS**

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Acroclor-1222	Acroclor-1242	Acroclor-1248	Acroclor-1254	Acroclor-1240 (Filtered)	Benzene	Benzol(a)anthracene	Benzol(a)pyrene	Benzol(b)fluoranthene	Benzol(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloroethoxy) Ether	Bi(2-ethylhexyl phosphite)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenzol(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06	
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09	
	Inhalation rate	IR	m3/hr																							
	Exposure time	ET	h/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d		0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00
	Risk	R	fraction		0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																								
Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d		0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.36007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	
Inhalation Reference Dose	RD <sub>inh</sub>	mg/kg-d							8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d							0.000163164										0.057615471							
Total Hazard Index	HI	mg/kg-d																								
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Water Ingestion rate	IR	l/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d		8.78356E-07	5.01918E-07	3.26247E-07	5.5211E-07	2.26863E-05	0.000414959	3.56362E-06	3.31266E-06	5.05307E-06	2.91123E-06	3.07726E-05	4.46203E-06	0.000602301	1.28219E-05	4.6337E-07	0.015896877	1.0514E-06	6.6674E-05	2.70329E-06	4.14082E-06	3.73929E-06	3.71419E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
	Risk	R	fraction		3.51E-07	2.01E-07	1.30E-07	2.21E-07	9.03E-06	2.28E-05	2.60E-06	2.42E-05	3.69E-06	2.13E-07	3.38E-05		8.43E-06	7.95E-07	5.89E-08		8.83E-08		1.97E-05		2.92E-07	5.94E-06
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
Average Intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d		1.02475E-05	5.85571E-06	3.80621E-06	6.44128E-06	0.000263307	0.004841187	4.15755E-05	3.86477E-05	5.89525E-05	3.39644E-05	0.000359014	5.2057E-05	0.007026849	0.000149589	5.28932E-06	0.185463562	1.22663E-05	0.000777863	3.15384E-05	4.83096E-05	4.3625E-05	4.33322E-05	
Ingestion Reference Dose	RD <sub>o</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d					0.322063927		1.210296804						0.001301425	0.351342466	0.007479452	0.0007556164	9.273178082	0.000613315	0.077786301		0.012077397	0.218125114	0.054165297	
Total Hazard Index	HI	mg/kg-d																								
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	event duration	t <sub>event</sub>	hr																							
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	6.85129E-08	2.99626E-07	2.08921E-07	5.6124E-07	0.000143389	1.76209E-06	1.20373E-06	1.91842E-06	2.96952E-06	1.6864E-06	2.26685E-08	1.1527E-07	2.47184E-05	2.80879E-08	3.28754E-09	0.000152749	2.14049E-09	1.6194E-07	2.4313E-06	1.98459E-07	2.41637E-07	4.62517E-07	
	Event frequency	EV	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		2.47773E-06	1.08358E-05	7.5555E-06	2.02969E-05	0.00518558	6.37248E-05	4.35323E-05	6.93786E-05	0.000107391	6.09875E-05	8.19794E-07	4.16866E-06	0.000893926	1.01578E-06	1.18892E-07	0.005524088	7.74093E-08	5.85645E-06	8.79266E-05	7.17714E-06	8.73864E-06	1.67266E-05
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
Risk	R	fraction		9.91E-07	4.33E-06	3.02E-06	8.12E-06	2.07E-03	3.50E-06	1.02E-05	1.63E-04	2.47E-06	4.45E-06	9.02E-07		1.25E-05	6.30E-08	1.55E-08		6.60E-09		6.42E-04		6.82E-07	2.68E-05	
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																								
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		2.89068E-05	0.000126418	8.81475E-05	0.000236797	0.060498432	0.000743456	0.000507877	0.000809417	0.001252895	0.00071152	9.56426E-06	4.86343E-05	0.010429134	1.18508E-05	1.38707E-06	0.064447698	9.03109E-07	6.83253E-05	0.00102581	8.37333E-05	0.000101951	0.000195144	
Dermal Reference Dose	RD <sub>der</sub>	mg/kg-d					2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d					11.63995998		0.185863921						0.001215858	2.744508883	0.000592539	0.001981533	10.39479003	4.51554E-05	0.034162651		0.020933313	0.509753746	0.243929995	
Total Hazard Index	HI	mg/kg-d																								
Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784	
	Volatilization factor	VF	dimensionless	Y		Y	Y	Y			Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	POE concentration	C <sub>air-vap</sub>	mg/m3	0	0.0000458	0	0.00005038	0.002061	0.037865	0	0	0.000461093	0	0.002808	0	0	0	0.00117	0.00004137	1.45059	0.00009594	0.006084	0	0.00037785	0.00034121	0.00033892
	Inhalation rate	IR	m3/hr																							
	Exposure time	ET	h/d																							
	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																				</			



TABLE 7-24  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern											
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	2.76E-08	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											0%	
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02				
Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-04			6.02959E-06	0.001413122	2.10889E-05				
Total Hazard Index	HI	mg/kg-d											0%		
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	POE concentration	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.91123E-06	1.55452E-06	1.87825E-05	2.02937E-06	4.1543E-05	2.26867E-05	2.95342E-05	8.35616E-05	0.000001872			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01			
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	1.67E-06	1.35E-06			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											11%	
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.39644E-05	1.81361E-05	0.000219129	2.3676E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
Hazard Quotient	HQ	mg/kg-d		0.004534018	0.010956438	0.047351963		0.0088226	0.034456621	3.249619482	0.00728				
Total Hazard Index	HI	mg/kg-d											13%		
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	event duration	tevent	hr												
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	1.78289E-06	0	3.29882E-07	3.98612E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	6.4477E-05	0	1.193E-05	1.44156E-07	1.33804E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01			
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	4.06E-08	7.31E-08			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											72%	
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000752231	0	0.000139183	1.68181E-06	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06				
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
Hazard Quotient	HQ	mg/kg-d		0	0.006959146	0.003363629		0.103086176	0.020003964	3.5046007297	0.000395006				
Total Hazard Index	HI	mg/kg-d											25%		
Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air</sub> <sub>exp</sub>	mg/m3	0	0.00014185	0.0017139	0.00018518	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	7.83478E-06	9.46636E-05	1.0228E-05	0	0	0.000148853	0.000421151	9.43488E-06			

not those with a "Y"



TABLE 7-24  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

							Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant- Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221				
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01				
				Risk	R <sub>i</sub>	fraction		5.19E-07	2.43E-07				6.82E-07			3.01E-05	0.00E+00						2.53E-06	0.00E+00				
				Total carcinogenic risk for exposure route																								
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		2.98317E-05	4.97593E-05	0.00393525	0.003534444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.015987156	0	0	0	0.001142492	0	0	7.37819E-05	0				
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01												
				Hazard Quotient	HQ	mg/kg-d						17.10442682	0.062468384	0.041003143		0.069509375												
				Total Hazard Index	HI	mg/kg-d																						
				POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				Water Ingestion rate	IR	l/d	0.05	3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				Exposure frequency	EF	d/y	32																					
Exposure duration	ED	y	6																									
Body weight	BW	kg	15																									
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																									
				Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.04286E-12	3.2523E-12	1.74052E-14	1.00943E-14				
				Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01				
				Risk	R <sub>i</sub>	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13		3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15				
				Total carcinogenic risk for exposure route																								
				Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13				
				Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05					
				Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09					
				Total Hazard Index	HI	mg/kg-d																						
								POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
								event duration	t <sub>event</sub>	hr	2																	
absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event						1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13				
Event frequency	EV	events/day	1																									
Exposure duration	ED	y	6																									
Exposure frequency	EF	d/y	32																									
Skin surface area	SA	cm2	6,600																									
Body weight	BW	kg	15																									
Averaging time	AT	d/y	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																									
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		5.44227E-12	1.61158E-11	5.06038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13				
				Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01				
				Risk	R <sub>i</sub>	fraction		1.09E-12	9.19E-13				1.45E-12	1.13E-12		6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13				
				Total carcinogenic risk for exposure route																								
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12				
				Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05					
				Hazard Quotient	HQ	mg/kg-d		1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24076E-07	0	4.59033E-07		7.11907E-07	0					
				Total Hazard Index	HI	mg/kg-d																						
				Carcinogenic risk - all routes (detected organics)																								
				Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction		6.33E-07	2.96E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	2.02E-08	4.42E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	3.03E-06	1.11E-06					
Non-Carcinogenic risk - all routes (detected organics)																												
Non-Carcinogenic risk - all routes (undetected organics)																												
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		0.000110697	0.002692128	0.00841963	0.076361895	17.9866156	0.063466717	0.050302792	0.177305719	0.243625516	0.214447013	0.037575024	0.017004619	0.050281315	0	0.1302624	0.209132423	0					

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-24  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

			Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloropropyl) Ether	Bi(2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-butadiene	Hexachlorobenzene
Incidental ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub> kg-d/mg fraction	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02							
	Risk	R <sub>i</sub> fraction	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04				1.19E-07							
	Total carcinogenic risk for exposure route																							
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub> mg/kg-d	0	2.95128E-05	0	3.2464E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	2.66581E-05	0.934736351	6.18222E-05	0.00392043	0	0.00024348	0.00021987	0.000218394
	Inhalation Reference Dose	RfD <sub>inh</sub> mg/kg-d						8.57E-03										1.70E-02						
Incidental ingestion of creek water	Hazard Quotient	HQ					2.847092598																	
	Total Hazard Index	HI																						
	POE concentration	C <sub>w</sub> ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003448704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	POE concentration	C <sub>w</sub> mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003448704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	Water ingestion rate	IR l/d																						
Incidental ingestion of creek water	Exposure frequency	EF d/y																						
	Exposure duration	ED y																						
	Body weight	BW kg																						
	Averaging time carcinogens	AT <sub>c</sub> d																						
	Averaging time non-carcinogens	AT <sub>n</sub> d																						
Incidental ingestion of creek water	Average Intake from ingestion carcinogens	I <sub>g</sub> mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.04082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13
	Ingestion Cancer Slope Factor	CSF <sub>o</sub> kg-d/mg fraction	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
	Risk	R <sub>i</sub> fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10		1.17E-13	5.62E-12	1.63E-13		6.24E-13		1.45E-15		4.05E-15	2.61E-13
	Total carcinogenic risk for exposure route																							
	Average Intake from ingestion non-carcinogens	I <sub>g</sub> mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.66841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>o</sub> mg/kg-d						2.00E-05						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04
	Hazard Quotient	HQ					4.467E-09	4.33179E-07						9.19697E-09	4.8731E-09	5.28548E-08	2.34702E-08	3.22819E-05	4.3342E-09	5.49704E-07	1.67513E-10	3.02538E-09	2.37824E-09	
	Total Hazard Index	HI																						
	POE concentration	C <sub>w</sub> ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003448704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06
	event duration	t <sub>event</sub> hr																						
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub> mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12
	Event frequency	EF events/day																						
	Exposure duration	ED y																						
	Exposure frequency	EF d/y																						
	Skin surface area	SA cm2																						
Dermal contact with creek water	Body weight	BW kg																						
	Averaging time	AT d/y																						
	Averaging time non-carcinogens	AT <sub>n</sub> d																						
	Absorbed dose for carcinogens	DAD <sub>c</sub> mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.0303E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11
	Dermal Cancer Slope Factor	CSF <sub>der</sub> kg-d/mg fraction	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
Dermal contact with creek water	Risk	R <sub>i</sub> fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10		4.91E-12	1.26E-11	1.39E-12		1.30E-12		1.34E-12		2.67E-13	3.32E-11
	Total carcinogenic risk for exposure route																							
	Absorbed dose for non-carcinogens	DAD <sub>n</sub> mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55844E-09	1.9924E-10	3.17535E-10	2.40879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13895E-12	3.28486E-11	3.99954E-11	2.42345E-10
	Dermal Reference Dose	RfD <sub>der</sub> mg/kg-d					2.00E-05	4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04
	Hazard Quotient	HQ					4.64479E-06	2.13966E-06						2.43026E-07	1.07667E-06	1.18434E-07	1.78352E-07	0.00108942	9.0257E-09	7.3499E-06	8.21216E-09	1.99977E-07	3.02932E-07	
Dermal contact with creek water	Total Hazard Index	HI																						
	Carcinogenic risk - all routes (detected organics)																							
	Carcinogenic risk - all routes (undetected organics)																							
	TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum Ri fraction	1.34E-06	5.55E-06	3.15E-06	9.45E-06	2.13E-03	8.34E-05	1.28E-05	1.87E-04	1.40E-05	4.66E-06	2.15E-04	0.00E+00	2.09E-05	8.58E-07	1.93E-07	0.00E+00	9.48E-08	2.73E-05	6.62E-04	0.00E+00	2.42E-06	6.28E-05
	Non-Carcinogenic risk - all routes (detected organics)																							
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum HI fraction		0	0	0	12.16192855	0	4.243419059	0	0	0	0	0	0.002517535	3.09585243	0.008072162	0.009537899	74.7111965	0.000658484	0.111956852	0	0.033010719	0.727879063	0.298095352



TABLE 7-24  
RME RISK CALCULATIONS FOR CHILD RESIDENT (MODERATE TCE SLOPE FACTOR, WELL D)  
MISSOURI ELECTRIC WORKS

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Vinyl Chloride		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg fraction	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	8.42E-06	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											7.89E-04	17%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0.914058E-05	0.001104409	0.000119327		0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04				1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d		1.288491933	0.208978893				0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d											7.31E-01	62%
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	At <sub>c</sub>	d												
	Averaging time non-carcinogens	At <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01			
	Risk	R	fraction	1.56E-16				2.06E-09	3.78E-14	1.85E-11	2.39E-11	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												0%
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d											9.9E-03	0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12			
	Event frequency	EF	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	At <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01			
	Risk	R	fraction	3.09E-14				5.11E-10	1.25E-11	3.04E-10	1.72E-11	1.73E-11			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction											8.18E-09	0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d											2.34E-03	0%
Carcinogenic risk - all routes (detected organics)														3.16E-03	
Carcinogenic risk - all routes (undetected organics)														1.03E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES														4.20E-03	
Non-Carcinogenic risk - all routes (detected organics)														1.09E-02	
Non-Carcinogenic risk - all routes (undetected organics)														1.41E-01	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES														1.24E+02	



TABLE 7-25

**RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)**  
Missouri Electric Works, Cape Girardeau

							Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3'-Dichlorodiphenyl ether	4,4'-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221				
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00				
				POE concentration	C <sub>soil</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00				
				Inhalation rate	IR	m3/hr	0.42																					
				Exposure time	ET	h/d	24																					
				Exposure frequency	EF	d/y	350																					
				Exposure duration	ED	y	6																					
				Body weight	BW	kg	15																					
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																					
				Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d		4.19218E-10	5.13666E-09	1.25379E-07	4.09828E-07	2.25902E-07	1.06047E-08	5.85468E-09	4.91573E-07	3.40235E-07	0	0	0	1.69013E-08	0	0	3.73374E-12	0				
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E+01	5.70E+02				9.10E+02			2.20E+02	1.09E+02									4.00E+01	4.00E+01	
				Risk	R	fraction		8.51E+11	2.93E+10				9.65E+10			7.49E+09	0.00E+00									1.49E+12	0.00E+00	
				Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																						
				Average intake from inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d		4.89087E-09	5.99277E-08	1.46275E-06	4.78133E-06	2.63553E-06	1.23722E-07	6.83047E-08	5.73501E-06	3.9694E-06	0	0	0	1.97181E-07	0	0	4.35603E-11	0				
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E+03	1.40E+03	1.14E+03														
				Hazard Quotient	HQ	mg/kg-d						0.002311867	8.83726E-05	5.99164E-05														
				Total Hazard Index	HI	mg/kg-d																						
				Groundwater	Tap Water	Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282
							POE concentration	C <sub>soil</sub>	mg/m3		0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
Water ingestion rate	IR	l/d	1																									
Exposure frequency	EF	d/y	350																									
Exposure duration	ED	y	6																									
Body weight	BW	kg	15																									
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																									
Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d					5.07342E-07	8.46247E-07	6.4926E-05	6.01096E-05	0.000331616	1.48734E-06	7.94959E-07	0.000241041	0.00027189	1.05786E-06	6.07759E-06	1.45753E-06	1.94301E-05	1.62997E-06	1.04707E-06	1.25479E-06	7.27781E-07					
Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg					2.00E+01	5.70E+02				9.10E+02	6.80E+02		2.40E+02	1.10E+02	6.80E+01	6.70E+00		4.50E+01			4.00E+01	4.00E+01				
Risk	R	fraction					1.01E-07	4.82E-08				1.35E-07	5.41E-08		6.53E-06	1.16E-08	4.13E-06	9.77E-06		7.33E-07			5.02E-07	2.91E-07				
Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																										
Average intake from ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d					5.919E-06	9.87288E-06	0.000780804	0.000701279	0.003868858	1.73523E-05	9.27452E-06	0.002812146	0.003172055	1.23417E-05	7.09052E-05	1.70044E-05	0.000226685	1.90163E-05	1.22158E-05	1.46393E-05	8.49078E-06					
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d					6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05						
Hazard Quotient	HQ	mg/kg-d					9.86499E-05	0.002468219	0.007808037	0.070127854	0.386885845	0.000867616	0.008431382	0.093738204	0.10573516	0.123417352	0.035452603	0.017004566	0.045336986		0.122157991	0.20913242						
Total Hazard Index	HI	mg/kg-d																										
Groundwater	Tap Water	Dermal contact with tap water	POE concentration				C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
			event duration				t <sub>event</sub>	hr	1																			
			absorbed dose per event				D <sub>absvent</sub>	mg/cm2-event		1.71293E-09	2.12216E-09	1.44936E-07	1.47042E-07	1.16844E-05	2.00651E-09	2.10687E-09	5.93365E-06	4.85357E-06	2.15732E-08	1.00576E-08	0	5.89864E-08	1.76154E-08	1.92039E-09	0	5.67678E-08		
			Event frequency	EV	events/day	1																						
			Exposure duration	ED	y	6																						
			Exposure frequency	EF	d/y	350																						
			Skin surface area	SA	cm2	6,600																						
			Body weight	BW	kg	15																						
			Averaging time	AT	d/y	25,550																						
			Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																						
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		6.19469E-08	7.67467E-08	5.24152E-06	5.31769E-06	0.000422559	7.25641E-08	7.61936E-08	0.000214587	0.000175526	7.80182E-07	3.63728E-07	0	2.11874E-06	6.37049E-07	6.9457E-08	0	2.05297E-06					
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E+01	5.70E+02				9.10E+02	6.80E+02		2.40E+02	1.10E+02	6.80E+01	6.70E+00		4.50E+01			4.00E+01	4.00E+01				
			Risk	R	fraction		1.24E-08	4.37E-09				6.60E-09	5.18E-09		4.21E-06	8.58E-09	2.91E-07	0.00E+00		2.87E-07			0.00E+00	8.21E-07				
			Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction																							
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		7.22714E-07	8.95378E-07	6.1151E-05	6.20397E-05	0.004929851	8.46581E-07	8.88925E-07	0.002503511	0.002047807	9.10213E-06	4.24349E-06	0	2.47186E-05	7.43224E-06	8.10332E-07	0	2.39513E-05					
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05						
			Hazard Quotient	HQ	mg/kg-d		1.20452E-05	0.000223845	0.00061151	0.006203967	0.492985057	4.2329E-05	0.000808114	0.083450362	0.068260247	0.091021282	0.002121746	0	0.004943729	0.008103318	0							
			Total Hazard Index	HI	mg/kg-d																							
			Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l			0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282	
Concentration in tap water	C <sub>soil</sub>	mg/m3					0.09259	0.15444	12.214	10.97	60.52	0.27144	0.14508	43.99	49.62	0.19306	1.10916	0.266	3.546	0.29747	0.19109	0.229	0.13282					
Volatilization factor	VF	dimensionless				0.0005 y																						
POE concentration	C <sub>soil-tap</sub>	mg/m3					0.000046295	0.00007722	0.006107	0.005485	0.03026	0.00013572	0.00007254	0.021995	0.02481	0	0	0	0.001773	0	0	0.0001145	0					
Inhalation rate	IR	m3/hr				0.42																						
Exposure time	ET	h/d				24																						
Exposure frequency	EF	d/y				350																						
Exposure duration	ED	y				6																						
Body weight	BW	kg				15																						
Averaging time carcinogens	AT <sub>c</sub>	d				25,550																						
Averaging time non-carcinogens	AT <sub>nc</sub>	d				2,190																						
Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d					2.55701E-06	4.26508E-06	0.000337307	0.000302952	0.001671347	7.49621E-06	4.00659E-06	0.001214847	0.001370328	0	0	0	9.79279E-05	0	0	6.32416E-06	0					



TABLE 7-25  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Acroder-1222	Acroder-1242	Acroder-1248	Acroder-1254	Acroder-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	bi(2-Chloroethyl) Ether	bi(2-Chloroethoxy) Ether	Bi (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour intrusion - Inhalation	POE concentration	C <sub>POE</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>POE</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average Intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.9221E-12	0	2.76164E-12	1.14884E-10	1.19855E-07	0	0	2.87763E-12	0	2.27007E-08	0	0	6.62795E-08	1.67908E-09	8.3954E-05	5.45148E-09	6.24132E-07	0	1.79507E-08	4.13142E-11	6.62795E-11
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00	
Risk	R	fraction	0.00E+00	7.69E-13	0.00E+00	1.10E-12	4.60E-11	3.27E-09	0.00E+00	0.00E+00	8.86E-13	0.00E+00	2.63E-08				8.73E-11			5.06E-08	0.00E+00		3.18E-12	1.07E-10	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average Intake from Inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	0	2.24245E-11	0	3.22192E-11	1.34032E-09	1.39831E-06	0	0	3.35724E-11	0	2.64842E-07	0	0	7.7326E-07	1.95893E-08	0.000979463	6.34007E-08	7.28153E-06	0	2.09425E-07	4.81999E-10	7.7326E-10	
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d						0.000163164										0.057615471							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average Intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	8.78356E-07	5.01918E-07	3.26247E-07	5.5211E-07	2.25843E-05	0.000414959	3.56342E-06	3.31266E-06	5.05307E-06	2.91123E-06	3.07726E-05	4.46203E-06	0.000602301	1.28219E-05	4.5337E-07	0.015896877	1.0514E-06	6.6674E-05	2.70329E-06	4.14082E-06	3.7929E-06	3.71419E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-01	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
Risk	R	fraction	3.51E-07	2.01E-07	1.30E-07	2.21E-07	9.03E-06	2.28E-05	2.60E-06	2.42E-05	3.69E-06	2.13E-07	3.38E-05		8.43E-06	7.95E-07	5.89E-08		8.83E-08		1.97E-05		2.92E-07	5.94E-06	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average Intake from Ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d	1.02475E-05	5.85571E-06	3.80621E-06	6.44128E-06	0.000263507	0.004841187	4.15755E-05	3.86477E-05	5.89525E-05	3.39644E-05	0.000359014	5.2057E-05	0.007026849	0.000149589	5.28932E-06	0.185463562	1.22663E-05	0.000777863	3.15384E-05	4.83096E-05	4.3625E-05	4.33322E-05	
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d				0.322063927		1.210296804						0.001301425	0.351342466	0.007479452	0.007556164	9.273178082	0.000613315	0.077786301	0.012077397	0.218125114	0.054165297		
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.08274	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	event duration	t <sub>event</sub>	hr																						
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	6.85129E-08	2.99626E-07	2.08921E-07	5.6124E-07	0.000143389	1.76209E-06	1.20373E-06	1.91842E-06	2.96952E-06	1.6864E-06	2.26685E-08	1.1527E-07	2.47184E-05	2.80679E-08	3.28754E-09	0.000152749	2.14049E-09	1.6194E-07	2.4313E-06	1.98459E-07	2.41637E-07	4.62517E-07
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	2.47773E-06	1.08358E-05	7.5555E-06	2.02969E-05	0.00518558	6.37248E-05	4.35323E-05	6.93786E-05	0.000107391	6.09875E-05	8.19794E-07	4.16866E-06	0.000893926	1.01578E-06	1.18892E-07	0.005524088	7.74093E-08	5.85645E-06	8.79266E-05	7.17714E-06	8.73844E-06	1.67266E-05	
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-								



TABLE 7-25  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indene[1,2,3-cd]pyrene	2-methyl-naphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.19E-05	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.19E-08	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	1.2096E-09	1.5189E-08	3.7945E-10	0	0	7.23551E-08	1.38082E-06	5.1698E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						1.52E-07	8.28E-09	1.55E-09			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										2.61E-07		0%
Ingestion of tap water	Average Intake from Inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	1.4112E-08	1.77205E-07	4.42692E-09	0	0	8.44142E-07	1.61096E-05	6.03143E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			0.000206774	7.75292E-04			6.02959E-06	0.001413122	2.10889E-05			
	Total Hazard Index	HI	mg/kg-d										6.19E-05		0%
	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	POE concentration	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
Dermal contact with tap water	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	2.91123E-06	1.55452E-06	1.87825E-05	2.02937E-06	4.1543E-05	2.26847E-05	2.95342E-05	8.35616E-05	0.000001872			
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R	fraction	2.13E-06				2.91E-04	2.72E-06	1.59E-05	5.01E-07	1.35E-06			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										4.68E-06		11%
	Average Intake from Ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	3.39644E-05	1.81361E-05	0.000219129	2.3676E-05	0.000484668	0.000264678	0.000344566	0.000974886	0.00002184			
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0.004534018	0.010956438	0.047351963		0.0088226	0.034456621	3.249619482	0.00728			
	Total Hazard Index	HI	mg/kg-d										1.21E+00		13%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	event duration	tevent	hr												
	absorbed dose per event	Dosevent	mg/cm2-event	1.78289E-06	0	3.29882E-07	3.98612E-09	3.69993E-08	7.32983E-06	4.7412E-07	3.73936E-07	2.80865E-09			
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	6.4477E-05	0	1.193E-05	1.44156E-07	1.33806E-06	0.000265079	1.71463E-05	1.35232E-05	1.01573E-07			
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01			
	Risk	R	fraction	1.48E-05				2.41E-06	3.18E-05	9.26E-06	1.22E-08	7.31E-08			
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction										3.02E-05		72%
Vapors from tap water	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000752231	0	0.000139183	1.68181E-06	1.56107E-05	0.003092585	0.00020004	0.00015777	1.18502E-06			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	0.006959146	0.003363629		0.103086176	0.020003964	3.506007297	0.000395006			
	Total Hazard Index	HI	mg/kg-d										3.04E+01		25%
	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313	0.2837	3.4278	0.37036	7.5816	4.14032	5.39	15.25	0.34164			
not those with a "y"	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air</sub>	mg/m3	0	0.00014185	0.0017139	0.00018518	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	7.83478E-06	9.46636E-05	1.0228E-05	0	0	0.000148853	0.000421151	9.43488E-06			



TABLE 7-25  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																				
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02							2.20E-02	1.09E-02						4.00E-01	4.00E-01
				Risk	R	fraction		5.19E-07	2.43E-07				6.82E-07			3.01E-05	0.00E+00						2.53E-06	0.00E+00
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		2.98317E-05	4.97593E-05	0.00393325	0.003534444	0.019499047	8.74557E-05	4.67436E-05	0.014173216	0.015987156	0	0	0	0.001142492	0	0	7.37819E-05	0
				Inhalation Reference Dose	IRD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01								
				Hazard Quotient	HQ	mg/kg-d						17.10442682	0.062468384	0.041003143		0.069509375								
				Total Hazard Index	HI	mg/kg-d																		
	Surface Water	Creek	Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
				POE concentration	C <sub>w</sub>	mg/m3		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
				Water ingestion rate	IR	l/d	0.05																	
				Exposure frequency	EF	d/y	52																	
				Exposure duration	ED	y	6																	
				Body weight	BW	kg	15																	
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																	
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	2,190																	
				Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.57586E-12	5.9803E-12	2.07879E-10	6.85807E-09	1.39035E-10	1.05108E-11	5.61785E-12	1.12849E-08	1.35446E-08	3.28583E-12	4.29494E-11	4.52634E-12	6.03519E-11	5.04286E-12	3.2523E-12	1.74052E-14	1.00943E-14
				Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
				Risk	R	fraction		3.15E-13	3.41E-13				9.56E-13	3.82E-13	3.25E-10	3.61E-14	2.92E-11	3.03E-11		2.28E-12		6.96E-15	4.04E-15	
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		1.8385E-11	6.97701E-11	2.42525E-09	8.00108E-08	1.62207E-09	1.22626E-10	6.55416E-11	1.31657E-07	1.5802E-07	3.83347E-11	5.01076E-10	5.28073E-11	7.04106E-10	5.90667E-11	3.79435E-11	2.03061E-13	1.17766E-13
				Ingestion Reference Dose	IRD <sub>g</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
				Hazard Quotient	HQ	mg/kg-d		3.06416E-10	1.74425E-08	2.42525E-08	8.00108E-06	1.62207E-07	6.13131E-09	5.95833E-08	4.38857E-06	5.26733E-06	3.83347E-07	2.50538E-07	5.28073E-08	1.40821E-07		3.79435E-07	2.90087E-09	
				Total Hazard Index	HI	mg/kg-d																		
		Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			event duration	t <sub>event</sub>	hr		2																	
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13
			Event frequency	EF	events/day		1																	
			Exposure duration	ED	y		6																	
			Exposure frequency	EF	d/y		52																	
			Skin surface area	SA	cm2		6,600																	
			Body weight	BW	kg		15																	
			Averaging time	AT	d/y		25,550																	
			Averaging time non-carcinogens	AT <sub>nc</sub>	d		2,190																	
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d			5.44227E-12	1.61158E-11	5.04038E-10	1.89193E-08	5.01093E-09	1.59872E-11	1.65998E-11	2.89968E-07	2.52537E-07	6.8542E-11	7.27022E-11	0	1.96728E-10	5.59672E-11	6.10206E-12	0	8.05383E-13
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02	2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01	
			Risk	R	fraction			1.09E-12	9.19E-13				1.45E-12	1.13E-12	6.06E-09	7.54E-13	5.82E-11	0.00E+00		2.52E-11		0.00E+00	3.22E-13	
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			6.34932E-11	1.88018E-10	5.90377E-09	2.20725E-07	5.84609E-08	1.86517E-10	1.93665E-10	3.38296E-06	2.94627E-06	7.99656E-10	8.48192E-10	0	2.29516E-09	6.52951E-10	7.11907E-11	0	9.39614E-12
			Dermal Reference Dose	IRD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
			Hazard Quotient	HQ	mg/kg-d			1.05822E-09	4.70044E-08	5.90377E-08	2.20725E-05	5.84609E-06	9.32587E-09	1.76059E-07	0.000112765	9.8209E-05	7.99656E-06	4.24096E-07	0	4.59033E-07		7.11907E-07	0	
			Total Hazard Index	HI	mg/kg-d																			
			Carcinogenic risk - all routes (detected organics)																					
			Carcinogenic risk - all routes (undetected organics)																					
			TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>t</sub>	fraction			6.33E-07	2.96E-07	0.00E+00	0.00E+00	0.00E+00	8.25E-07	5.92E-08	0.00E+00	4.09E-05	2.02E-08	4.42E-06	9.77E-06	0.00E+00	1.02E-06	0.00E+00	3.03E-06	1.11E-06
			Non-Carcinogenic risk - all routes (detected organics)																					
			Non-Carcinogenic risk - all routes (undetected organics)																					
			TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum HI	fraction			0.000110697	0.002392128	0.00841963	0.076361895	17.9866156	0.063466717	0.050302792	0.177305719	0.243623516	0.214447013	0.037575024	0.017004619	0.050281315	0	0.1302624	0.209132423	0

Notes  
1 ug/l = micrograms per liter  
2 ug/m3 = micrograms per cubic meter  
3 h/d = hours per day  
4 l/d = liters per day  
5 d/y = days per year  
6 y = year  
7 kg = kilogram  
8 d = day  
9 hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12 cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16 mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-25  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)  
Missouri Electric Works, Cape Girardeau

			Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	1,1-Dichloroethane	1,1,2,2-Tetrachloroethane	1,2-Dichloroethane	1,2,3,4-Tetrachlorobenzene	1,2,4-Trichlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	1,2,4,5-Tetrachlorobenzene	
Incidental ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00												
	Risk	R <sub>i</sub>	fraction	0.00E+00	1.01E-06	0.00E+00	1.11E-06	4.55E-05	5.71E-05	0.00E+00	0.00E+00	7.84E-06	0.00E+00	1.80E-04												
	Total carcinogenic risk for exposure route																									
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	2.95128E-05	0	3.2464E-05	0.001328075	0.024399584	0	0	0.00029712	0	0.001809429	0	0	0.000753929	2.66581E-05	0.934736351	6.18222E-05	0.003992043	0	0.00024348	0.00021987	0.000218394	
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Incidental ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					2.847092598										54.98449122								
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>po</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774468	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	POE concentration	C <sub>po</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774468	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	Water ingestion rate	IR	l/d																							
Incidental ingestion of creek water	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
Incidental ingestion of creek water	Average Intake from ingestion carcinogens	I <sub>i</sub>	mg/kg-d	1.21827E-14	6.96157E-15	4.52502E-15	7.65772E-15	3.1327E-13	1.48519E-10	4.94271E-14	4.59463E-14	3.71993E-16	2.14317E-16	2.17465E-10	3.15325E-11	8.35388E-12	9.06082E-11	1.40821E-12	5.53403E-08	7.43006E-12	4.71175E-10	1.99009E-16	5.74329E-14	5.18637E-14	1.63079E-13	
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-01	1.10E+00												
	Risk	R <sub>i</sub>	fraction	4.87E-15	2.78E-15	1.81E-15	3.06E-15	1.25E-13	8.17E-12	3.61E-14	3.35E-13	2.72E-16	1.56E-17	2.39E-10												
	Total carcinogenic risk for exposure route																									
	Average Intake from ingestion non-carcinogens	I <sub>i</sub>	mg/kg-d	1.42132E-13	8.12183E-14	5.27919E-14	8.93401E-14	3.65482E-12	1.73272E-09	5.7665E-13	5.36041E-13	4.33992E-15	2.50037E-15	2.5371E-09	3.67879E-10	9.74619E-11	1.0571E-09	1.64291E-11	6.45637E-07	8.68841E-11	5.49704E-09	2.32177E-15	6.70051E-13	6.05076E-13	1.90259E-12	
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d					2.00E-06																		
	Hazard Quotient	HQ	mg/kg-d					4.467E-09																		
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>po</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774468	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	event duration	tevent	hr																							
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91188E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	
	Event frequency	EF	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
Dermal contact with creek water	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	9.72014E-13	4.25089E-12	2.96403E-12	7.96249E-12	2.03431E-09	7.33597E-10	1.70778E-11	2.72173E-11	2.23611E-13	1.26989E-13	1.70664E-10	8.33234E-10	3.50688E-10	2.03033E-10	1.07011E-11	5.78949E-07	1.54726E-11	1.25998E-09	1.83082E-13	2.8156E-12	3.42817E-12	2.07725E-11	
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00												
Dermal contact with creek water	Risk	R <sub>i</sub>	fraction	3.89E-13	1.70E-12	1.19E-12	3.18E-12	8.14E-10	4.03E-11	4.01E-12	6.40E-11	5.14E-15	9.27E-15	1.88E-10												
	Total carcinogenic risk for exposure route																									
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.13402E-11	4.95937E-11	3.45803E-11	9.28958E-11	2.37336E-08	8.55864E-09	1.9924E-10	3.17535E-10	2.60879E-12	1.48154E-12	1.99108E-09	9.72106E-09	4.09136E-09	2.36868E-09	1.24846E-10	6.7544E-06	1.80514E-10	1.46998E-08	2.13595E-12	3.28486E-11	3.99954E-11	2.42345E-10	
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d					2.00E-05																		
	Hazard Quotient	HQ	mg/kg-d					4.64479E-06																		
Dermal contact with creek water	Total Hazard Index	HI	mg/kg-d																							
	Carcinogenic risk - all routes (detected organics)																									
	Carcinogenic risk - all routes (undetected organics)																									
	TOTAL CARCINOGENIC RISK - ALL ROUTES			Sum RI	fraction	1.34E-06	5.55E-06	3.15E-06	9.45E-06	2.13E-03	8.34E-05	1.28E-05	1.87E-04	1.40E-05	4.66E-06	2.15E-04	0.00E+00	2.09E-05	8.58E-07	1.93E-07	0.00E+00	9.48E-08	2.73E-05	6.62E-04	0.00E+00	2.42E-06
	Non-Carcinogenic risk - all routes (detected organics)																									
Non-Carcinogenic risk - all routes (undetected organics)																										
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES			Sum HI	fraction	0	0	0	12.16192855	0	4.243419059	0	0	0	0	0.002517535	3.09585243	0.008072162	0.009537899	74.7111965	0.000658484	0.111956852	0	0.033010719	0.727879063	0.298095552	



TABLE 7-25  
RME RISK CALCULATIONS FOR CHILD RESIDENT (LOW TCE SLOPE FACTOR, WELL D)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylazulene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						3.13E-04	2.53E-06	2.83E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.88E-04		
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	9.14058E-05	0.001104409	0.000119327	0	0	0.001736614	0.004913425	0.000110074			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d			8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d			1.288691933	0.208978893			0.012404384	0.431002163	0.003848727			
	Total Hazard Index	HI	mg/kg-d										7.21E-03		
	Incidental Ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004		
		POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004		
		Water ingestion rate	IR	l/d											
		Exposure frequency	EF	d/y											
		Exposure duration	ED	y											
Body weight		BW	kg												
Averaging time carcinogens		AT <sub>c</sub>	d												
Averaging time non-carcinogens		AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	2.14317E-16	4.82755E-12	5.83402E-11	6.30342E-12	2.93578E-10	3.14663E-13	3.42372E-11	1.19413E-09	1.32291E-11			
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg					7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01			
	Risk	R	fraction					2.06E-09	3.78E-14	1.85E-11	7.16E-12	9.52E-12			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										0%		
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	2.50037E-15	5.63215E-11	6.80636E-10	7.354E-11	3.42508E-09	3.67107E-12	3.99434E-10	1.39315E-08	1.5434E-10			
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		1.40804E-08	3.40318E-08	1.4708E-07		1.22369E-10	3.99434E-08	4.64384E-05	5.14467E-08			
	Total Hazard Index	HI	mg/kg-d										0%		
	Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.0001186	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004		
		event duration	tevent	hr											
		absorbed dose per event	Daevent	mg/cm2-event	2.49869E-14	0	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12		
		Event frequency	EV	events/day											
Exposure duration		ED	y												
Exposure frequency		EF	d/y												
Skin surface area		SA	cm2												
Body weight		BW	kg												
Averaging time		AT	d/y												
Averaging time non-carcinogens		AT <sub>nc</sub>	d												
		Absorbed dose for carcinogens	DAD <sub>g</sub>	mg/kg-d	1.34255E-13	0	1.07639E-09	1.35762E-11	2.83647E-10	1.03991E-10	5.62195E-10	5.73079E-09	2.3968E-11		
		Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg					1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01		
		Risk	R	fraction					5.11E-10	1.25E-11	3.04E-10	5.16E-12	1.73E-11		
		Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										8.17E-09	
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	1.5663E-12	0	1.25579E-08	1.58389E-10	3.30921E-09	1.21322E-09	6.55894E-09	6.68592E-08	2.79627E-10			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d		0	6.27894E-07	3.16778E-07		4.04408E-08	6.55894E-07	0.001485759	9.32089E-08			
	Total Hazard Index	HI	mg/kg-d										2.84E-03		
Carcinogenic risk - all routes (detected organics)													3.15E-03		
Carcinogenic risk - all routes (undetected organics)													1.03E-03		
TOTAL CARCINOGENIC RISK - ALL ROUTES													4.19E-03		
Non-Carcinogenic risk - all routes (detected organics)													1.09E+02		
Non-Carcinogenic risk - all routes (undetected organics)													1.41E+01		
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES													1.24E+02		







TABLE 7-26  
RME RISK CALCULATIONS FOR ADULT RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Acrolein-1222	Acrolein-1242	Acrolein-1248	Acrolein-1254	Acrolein-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	1,2-Dichloroethyl Ether	1,2-Dichloropropyl Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-dioxane	Hexachlorobenzene
Vapour Intrusion - Inhalation	POE concentration	C <sub>inh</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>inh</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	3.25581E-12	0	4.67789E-12	1.944E-10	2.0302E-07	0	0	4.87436E-12	0	3.84522E-08	0	0	1.12269E-07	2.84415E-09	0.000142208	9.23415E-09	1.0572E-06	0	3.04063E-08	6.99812E-11	1.12269E-10
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02				3.08E-01		7.70E-02	1.61E+00	
Risk	R	fraction	0.00E+00	1.30E-12	0.00E+00	1.87E-12	7.78E-11	5.54E-09	0.00E+00	0.00E+00	1.60E-12	0.00E+00	4.46E-08				1.48E-10				8.56E-08	0.00E+00	5.39E-12	1.81E-10	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average intake from inhalation non-carcinogens	I <sub>n</sub>	mg/kg-d	0	9.49611E-12	0	1.36438E-11	5.67584E-10	5.92142E-07	0	0	1.42169E-11	0	1.12152E-07	0	0	3.27452E-07	8.29545E-09	0.000414773	2.69329E-08	3.08351E-06	0	8.86849E-08	2.04112E-10	3.27452E-10	
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03										1.70E-02							
Hazard Quotient	HQ	mg/kg-d						6.90948E-05										0.024398388							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.50575E-06	8.60431E-07	5.5928E-07	9.46474E-07	3.87194E-05	0.000711358	6.10904E-06	5.67884E-06	8.6424E-06	4.99048E-06	5.2753E-05	7.64919E-06	0.001032617	2.19804E-05	4.12274E-07	0.027251789	1.8024E-06	0.000114298	4.63421E-06	7.09855E-06	6.41021E-06	6.36719E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00
Risk	R	fraction	6.02E-07	3.44E-07	2.24E-07	3.79E-07	1.55E-05	3.91E-05	4.46E-06	4.15E-05	6.32E-06	3.64E-07	5.80E-05		1.45E-05	1.36E-06	5.36E-08		1.51E-07		3.38E-05		5.00E-07	1.02E-05	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average intake from ingestion non-carcinogens	I <sub>n</sub>	mg/kg-d	4.39178E-06	2.50959E-06	1.63123E-06	2.76055E-06	0.000112932	0.002074795	1.78181E-05	1.65633E-05	2.52653E-05	1.45562E-05	0.000153843	2.23101E-05	0.003011507	6.41096E-05	1.20247E-06	0.079484384	5.25699E-06	0.000333337	1.35164E-05	2.07041E-05	1.86944E-05	1.8571E-05	
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03		8.00E-04	
Hazard Quotient	HQ	mg/kg-d				0.138027397		0.51869863						0.000557753	0.150575342	0.003205479	0.001717808	3.974219178	0.000262849	0.033336986		0.005176027	0.093482192	0.023213699	
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration event duration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	5.21778E-08	2.28188E-07	1.59109E-07	4.27428E-07	0.000109202	1.28037E-06	9.16736E-07	1.46103E-06	2.26152E-06	1.28432E-06	1.72638E-08	8.77868E-08	1.8825E-05	2.13911E-08	1.32811E-09	0.00011633	1.63014E-09	1.2333E-07	1.85163E-06	1.51142E-07	1.84025E-07	3.52242E-07
	Event frequency	EV	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	AT <sub>n</sub>	d																						
	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	4.41112E-06	1.92911E-05	1.34511E-05	3.61348E-05	0.009231943	0.000108242	7.7501E-05	0.000123515	0.000191189	0.000108577	1.45949E-06	7.4215E-06	0.001591465	1.8084E-06	1.12279E-07	0.009834593	1.37813E-07	1.04263E-05	0.000156537	1.27775E-05	1.55575E-05	2.97786E-05
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
Risk	R	fraction	1.76E-06	7.72E-06	5.38E-06																				



TABLE 7-26  
RME RISK CALCULATIONS FOR ADULT RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.75E-04	6.87E-06	0.00E+00	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04			
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.75E-07	6.87E-09	0.00E+00	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	2.57284E-08	6.42742E-10	0	0	0	1.22561E-07	2.33894E-06	8.787E-08			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						2.57E-07	9.36E-07	2.63E-09			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.36E-06		0%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	7.50411E-08	1.87466E-09	0	0	0	3.57468E-07	6.82192E-06	2.55413E-07			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04				1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d		8.75625E-05	3.28312E-06				2.55335E-06	0.000598414	8.93051E-06			
	Total Hazard Index	HI	mg/kg-d										2.62E-05		0%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	POE concentration	C <sub>w</sub>	mg/m3	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.99068E-06	1.70799E-05	1.84542E-06	7.12166E-05	3.88915E-05	5.06301E-05	0.000143249	3.20914E-06				
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01			7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01				
	Risk	R	fraction	3.64E-06			4.99E-04	4.67E-06	2.73E-05	5.73E-05	2.31E-06				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										4.81E-06		11%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.45562E-05	4.98164E-05	5.38247E-06	0.000207715	0.000113433	0.000147671	0.000417808	0.00000936				
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		0.002490822	0.010764932		0.003781114	0.014767123	1.392694064	0.00312				
	Total Hazard Index	HI	mg/kg-d										6.88E-05		13%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.35781E-06	1.33267E-07	1.61033E-09	2.81779E-08	5.58223E-06	3.61079E-07	2.84781E-07	2.01884E-09				
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	0.000114789	1.12664E-05	1.36137E-07	2.38216E-06	0.000471922	3.05257E-05	2.40754E-05	1.70673E-07				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01			1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01				
	Risk	R	fraction	2.64E-05			4.29E-06	5.66E-05	1.65E-05	1.44E-06	1.23E-07				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										5.38E-05		70%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000334801	4.00E-03	3.28603E-05	3.97067E-07	6.94796E-06	0.001376441	8.90332E-05	7.022E-05	4.97795E-07			
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d			2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03			
	Hazard Quotient	HQ	mg/kg-d			0.001643016	0.000794134		0.045881353	0.008903317	1.560445485	0.000165932			
	Total Hazard Index	HI	mg/kg-d										1.35E+01		26%
Vapors from tap water [3/mol. those with a "Y"]	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air-top</sub>	mg/m3	0	0.00090915	0.00009823	0	0	0	0.002695	0.007625	0.00017082			
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	8.5058E-05	9.19018E-06	0	0	0	0.000252138	0.000713378	1.59815E-05			



TABLE 7-26  
RME RISK CALCULATIONS FOR ADULT RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

										Chemicals of Potential Concern																		
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221				
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg fraction		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02							4.00E-01	4.00E-01			
				Risk	R	fraction		4.66E-07	4.12E-07				1.16E-06			5.11E-05	0.00E+00								4.28E-06	0.00E+00		
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		6.70117E-06	2.10715E-05	0.000883984	0.001496729	0.008257249	3.70348E-05	1.97945E-05	0.004001923	0.006770071	0	0	0	0.000256641	0	0	3.12444E-05	0				
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01												
				Hazard Quotient	HQ	mg/kg-d						7.243201154	0.026453448	0.017363576		0.029435092												
				Total Hazard Index	HI	mg/kg-d																						
				POE concentration	C <sub>pw</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				POE concentration	C <sub>pw</sub>	mg/m3		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				Water ingestion rate	IR	l/d	0.05																					
				Exposure frequency	EF	d/y	52																					
Exposure duration	ED	y	24																									
Body weight	BW	kg	70																									
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	8,760																									
Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.35073E-12	5.12597E-12	1.78182E-10	5.87834E-09	1.19172E-10	9.00928E-12	4.8153E-12	9.67277E-09	1.16096E-08	2.81642E-12	3.68138E-11	3.87972E-12	5.17302E-11	4.33959E-12	2.78768E-12	1.49188E-14	8.65223E-15								
Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg fraction		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01								
Risk	R			2.70E-13	2.92E-13				8.20E-13	3.27E-13		2.79E-10	3.10E-14	2.50E-11	2.60E-11		1.95E-12		5.97E-15	3.46E-15								
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																										
Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		3.93964E-12	1.49507E-11	5.19697E-10	1.71452E-08	3.47586E-10	2.62771E-11	1.40446E-11	2.82122E-08	3.38614E-08	8.21457E-12	1.07373E-10	1.13159E-11	1.5088E-10	1.26571E-11	8.13075E-12	4.35131E-14	2.52357E-14								
Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05									
Hazard Quotient	HQ	mg/kg-d		6.56607E-11	3.73769E-09	5.19697E-09	1.71452E-06	3.47586E-08	1.31385E-09	1.27678E-08	9.40408E-07	1.12871E-06	8.21457E-08	5.36867E-08	1.13159E-08	3.0176E-08		8.13075E-08	6.21616E-10									
Total Hazard Index	HI	mg/kg-d																										
				POE concentration	C <sub>pw</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				event duration	t <sub>event</sub>	hr	2																					
				absorbed dose per event	D <sub>event</sub>	mg/cm2-event		1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13				
				Event frequency	EV	events/day	1																					
				Exposure duration	ED	y	24																					
				Exposure frequency	EF	d/y	52																					
				Skin surface area	SA	cm2	18,000																					
				Body weight	BW	kg	70																					
				Averaging time	AT	d/y	25,550																					
				Averaging time non-carcinogens	AT <sub>nc</sub>	d	8,760																					
				Absorbed dose for carcinogens	DAD <sub>der</sub>	mg/kg-d		1.27222E-11	3.76733E-11	1.18295E-09	4.4227E-08	1.17139E-08	3.73727E-11	3.88048E-11	6.77847E-07	5.90347E-07	1.60228E-10	1.69953E-10	0	4.59884E-10	1.30832E-10	1.42646E-11	0	1.88271E-12				
Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg fraction		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01								
Risk	R	fraction		2.54E-12	2.15E-12				3.40E-12	2.64E-12		1.42E-08	1.76E-12	1.36E-10	0.00E+00		5.89E-11		0.00E+00	7.53E-13								
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																										
Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		3.71064E-11	1.0988E-10	3.45026E-09	1.28995E-07	3.41655E-08	1.09004E-10	1.13181E-10	1.97705E-06	1.72185E-06	4.67332E-10	4.95697E-10	0	1.34133E-09	3.81594E-10	4.16049E-11	0	5.49125E-12								
Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05									
Hazard Quotient	HQ	mg/kg-d		6.1844E-10	2.74701E-08	3.45026E-08	1.28995E-05	3.41655E-06	5.45018E-09	1.02891E-07	6.59018E-05	5.73949E-05	4.67332E-06	2.47848E-07	0	2.68266E-07		4.16049E-07	0									
Total Hazard Index	HI	mg/kg-d																										
Carcinogenic risk - all routes (detected organics)																												
Carcinogenic risk - all routes (undetected organics)																												
TOTAL CARCINOGENIC RISK - ALL ROUTES								Sum RI	fraction	5.71E-07	5.03E-07	0.00E+00	0.00E+00	0.00E+00	1.40E-06	1.02E-07	0.00E+00	6.98E-05	1.87E-08	7.60E-06	8.88E-06	0.00E+00	9.38E-07	0.00E+00	5.15E-06	1.96E-06		
Non-Carcinogenic risk - all routes (detected organics)																												
Non-Carcinogenic risk - all routes (undetected organics)																												
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES								Sum HI	fraction	2.52714E-05	0.001157468	0.001915364	0.032748781	7.629408459	0.026880996	0.021342187	0.077382249	0.105197103	0.049551913	0.016138616	0.003865765	0.011474335	0	0.029484879	0.089428181	0		

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-26  
RME RISK CALCULATIONS FOR ADULT RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																							
Exposure Route	Parameter	Symbol	Units	Acroclor-1232	Acroclor-1242	Acroclor-1248	Acroclor-1254	Acroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	Benz(ghi)perylene	Di(2-Chloroethyl) Ether	Di(2-Chloroethyl) Ether	Di(2-ethylhexyl phthalate)	Bromochloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	3.08E-01	1.16E+00					5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00
	Risk	R <sub>i</sub>	fraction	0.00E+00	1.71E-06	0.00E+00	1.89E-06	7.71E-05	9.67E-05	0.00E+00	0.00E+00	1.33E-05	0.00E+00	3.05E-04					1.07E-07			4.61E-05	0.00E+00		2.46E-06	5.11E-05	
	Total carcinogenic risk for exposure route																										
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	1.24978E-05	0	1.37475E-05	0.000562399	0.010332477	0	0	0.000125821	0	0.000766238	0	0	0.000319266	5.98828E-06	0.39583223	2.61798E-05	0.001660182	0	0.000103106	9.31083E-05	9.24834E-05		
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03																		
Incidental ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					1.205656559																			
	Total Hazard Index	HI	mg/kg-d																								
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	Water ingestion rate	IR	l/d																								
	Exposure frequency	EF	d/y																								
	Exposure duration	ED	y																								
	Body weight	BW	kg																								
	Averaging time carcinogens	AT <sub>c</sub>	d																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.04423E-14	5.96706E-15	3.87859E-15	6.56376E-15	2.68518E-13	1.27302E-10	4.23661E-14	3.93826E-14	3.18851E-16	1.837E-16	1.86399E-10	2.70278E-11	7.16047E-12	7.76642E-11	1.20704E-12	4.74346E-08	6.36863E-12	4.03864E-10	1.70579E-16	4.92282E-14	4.44546E-14	1.39782E-13		
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00													
	Risk	R <sub>i</sub>	fraction	4.18E-15	2.39E-15	1.55E-15	2.63E-15	1.07E-13	7.00E-12	3.09E-14	2.87E-13	2.33E-16	1.34E-17	2.05E-10													
	Total carcinogenic risk for exposure route																										
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	3.04569E-14	1.74039E-14	1.13125E-14	1.91443E-14	7.83176E-13	3.71297E-10	1.23568E-13	1.14866E-13	9.29983E-16	5.35793E-16	5.43663E-10	7.88312E-11	2.08847E-11	2.26521E-10	3.62053E-12	1.38351E-07	1.85752E-11	1.17794E-09	4.97522E-16	1.43582E-13	1.29659E-13	4.07698E-13		
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d				2.00E-05		4.00E-03																		
	Hazard Quotient	HQ	mg/kg-d				9.57215E-10		9.28242E-08																		
	Total Hazard Index	HI	mg/kg-d																								
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06		
	event duration	event	hr																								
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52666E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12		
	Event frequency	EF	events/day																								
	Exposure duration	ED	y																								
	Exposure frequency	EF	d/y																								
	Skin surface area	SA	cm2																								
	Body weight	BW	kg																								
	Averaging time	AT	d/y																								
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																								
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	2.27224E-12	9.93714E-12	6.9289E-12	1.86136E-11	4.75552E-09	1.7149E-09	3.9922E-11	6.36248E-11	5.22726E-13	2.96857E-13	3.98954E-10	1.94782E-09	8.1979E-10	4.74615E-10	2.50156E-11	1.35339E-06	3.61698E-11	2.94541E-09	4.27983E-13	6.58192E-12	8.01392E-12	4.8559E-11		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00													
Dermal contact with creek water	Risk	R <sub>i</sub>	fraction	9.09E-13	3.97E-12	2.77E-12	7.45E-12	1.90E-09	9.43E-11	9.38E-12	1.50E-10	1.20E-14	2.17E-14	4.39E-10													
	Total carcinogenic risk for exposure route																										
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	6.62737E-12	2.89833E-11	2.02093E-11	5.42897E-11	1.38703E-08	5.0018E-09	1.16439E-10	1.85572E-10	1.52462E-12	8.65833E-13	1.16362E-09	5.68114E-09	2.39105E-09	1.38429E-09	7.29422E-11	3.94738E-06	1.05495E-10	8.59079E-09	1.24828E-12	1.91973E-11	2.33739E-11	1.4163E-10		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05		4.00E-03																		
	Hazard Quotient	HQ	mg/kg-d				2.71449E-06		1.25045E-06																		
	Total Hazard Index	HI	mg/kg-d																								
	Carcinogenic risk - all routes (detected organics)																										
	Carcinogenic risk - all routes (undetected organics)																										
	TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum Ri	fraction	2.37E-06	9.77E-06	5.60E-06	1.67E-05	3.79E-03	1.42E-04	2.27E-05	3.32E-04	2.40E-05	8.29E-06	3.64E-04	0.00E+00	3.67E-05	1.47E-06	1.75E-07	0.00E+00	1.63E-07	4.62E-05	1.18E-03	0.00E+00	4.17E-06
	Non-Carcinogenic risk - all routes (detected organics)																										
Non-Carcinogenic risk - all routes (undetected organics)																											
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0	0	5.407687156	0	1.803352269	0	0	0	0	0	0.001099049	1.372095334	0.003469286	0.002185746	31.9099987	0.000282953	0.048546432	0	0.014492982	0.320362308	



TABLE 7-26  
RME RISK CALCULATIONS FOR ADULT RESIDENT (HIGH TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	4.00E-01	3.00E-02			
	Risk	R	fraction	0.00E+00						5.29E-04	2.85E-04	4.79E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.47E-06		19%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	0.000248084	2.68047E-05	0	0	0	0.000735403	0.002080685	4.66128E-05			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04				1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d		0.289481754	0.046943397				0.005252877	0.182516222	0.001629818		2.30E-01	61%
	Total Hazard Index	HI	mg/kg-d												
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	Water ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.837E-16	5.00059E-11	5.40294E-12	2.51638E-10	2.69711E-13	2.93462E-11	1.02354E-09	1.13393E-11				
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01			7.00E+00	1.20E-01	5.40E-01	4.00E-01	7.20E-01				
	Risk	R	fraction	1.34E-16			1.76E-09	3.24E-14	1.58E-11	4.09E-10	8.16E-12				0%
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction												0%
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	5.35793E-16	1.45851E-10	1.57586E-11	7.33945E-10	7.86657E-13	8.5593E-11	2.98533E-09	3.30728E-11				
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		7.29253E-09	3.15171E-08		2.62219E-11	8.5593E-09	9.95109E-06	1.10243E-08				0%
	Total Hazard Index	HI	mg/kg-d												0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49869E-14	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12				
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.13842E-13	2.51624E-09	3.17365E-11	6.6307E-10	2.43095E-10	1.31422E-09	1.33966E-08	5.60291E-11				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01			1.80E+00	1.20E-01	5.40E-01	6.00E-02	7.20E-01				
	Risk	R	fraction	7.22E-14			1.19E-09	2.92E-11	7.10E-10	8.04E-10	4.03E-11				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.99E-08		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	9.15373E-13	7.33902E-09	9.25649E-11	1.93395E-09	7.09027E-10	3.83315E-09	3.90735E-08	1.63418E-10				
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		3.66951E-07	1.8513E-07		2.36342E-08	3.83315E-07	0.000868301	5.44727E-08				
	Total Hazard Index	HI	mg/kg-d										1.66E-08		0%
Carcinogenic risk - all routes (detected organics)														5.87E-03	
Carcinogenic risk - all routes (undetected organics)														1.82E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction	3.00E-05	0.00E+00	0.00E+00	5.03E-04	6.13E-05	5.74E-04	3.45E-04	2.92E-06	7.70E-03	
Non-Carcinogenic risk - all routes (detected organics)														4.65E+01	
Non-Carcinogenic risk - all routes (undetected organics)														6.14E+00	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction	0	0.293703529	0.058505962	0	0.04966249	0.028926262	3.137132437	0.004924744	8.27E+01	



TABLE 7-27

[illegible]



TABLE 7-27  
RME RISK CALCULATIONS FOR ADULT RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Acroder-1223	Acroder-1242	Acroder-1248	Acroder-1254	Acroder-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	bis(2-Chloroethyl) Ether	bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl) phthalate	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-04	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	3.25581E-12	0	4.67789E-12	1.946E-10	2.0302E-07	0	0	4.87436E-12	0	3.84522E-08	0	0	1.12269E-07	2.84415E-09	0.000142208	9.23415E-09	1.0572E-06	0	3.04063E-08	6.99812E-11	1.12269E-10
Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02			8.10E-02	3.08E-01		7.70E-02	1.61E+00	
Risk	R	fraction	0.00E+00	1.30E-12	0.00E+00	1.87E-12	7.78E-11	5.54E-09	0.00E+00	0.00E+00	1.50E-12	0.00E+00	4.46E-08				1.48E-10			8.56E-08	0.00E+00		6.39E-12	1.81E-10	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	9.49611E-12	0	1.36438E-11	5.67584E-10	5.92142E-07	0	0	1.42189E-11	0	1.12152E-07	0	0	3.27452E-07	8.29545E-09	0.000414773	2.69329E-08	3.08351E-06	0	8.86849E-08	2.04112E-10	3.27452E-10	
Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d																							
Hazard Quotient	HQ	mg/kg-d																							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	POE concentration	C <sub>w</sub>	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	AT <sub>c</sub>	d																						
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																						
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	1.50575E-06	8.60431E-07	5.5928E-07	9.46474E-07	3.87194E-05	0.000711358	6.10904E-06	5.67884E-06	8.6624E-06	4.99048E-06	5.2753E-05	7.64919E-06	0.001032617	2.19804E-05	4.12274E-07	0.027251789	1.8024E-06	0.000114298	4.63421E-06	7.09855E-06	6.41021E-06	6.36719E-06
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00				1.40E-02			8.40E-02	7.30E+00		7.80E-02	1.60E+00
Risk	R	fraction	6.02E-07	3.44E-07	2.24E-07	3.79E-07	1.55E-05	3.91E-05	4.46E-06	4.15E-05	6.32E-06	3.64E-07	5.80E-05				1.45E-05			1.51E-07	3.38E-05		5.00E-07	1.02E-05	
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	4.39178E-06	2.50959E-06	1.63123E-06	2.76055E-06	0.000112932	0.002074795	1.78181E-05	1.65633E-05	2.52653E-05	1.45562E-05	0.000153863	2.23101E-05	0.003011507	6.41094E-05	1.20247E-06	0.079484384	5.25699E-06	0.00033337	1.35164E-05	2.07041E-05	1.86944E-05	1.8571E-05	
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d																							
Hazard Quotient	HQ	mg/kg-d																							
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	event duration	t <sub>event</sub>	hr																						



TABLE 7-27  
RME RISK CALCULATIONS FOR ADULT RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrodi-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00	2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04				
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00	2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07				
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	2.57284E-08	6.42742E-10	0	0	1.22561E-07	2.33894E-06	8.757E-08				
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01					2.10E+00	2.00E-02	3.00E-02				
	Risk	R	fraction	0.00E+00					2.57E-07	4.68E-08	2.63E-09				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										4.38E-09		0%
	Average intake from inhalation non-carcinogens	I <sub>nc</sub>	mg/kg-d	0	7.50411E-08	1.87466E-09	0	0	3.57468E-07	6.82192E-06	2.55413E-07				
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02				
	Hazard Quotient	HQ	mg/kg-d		8.75625E-05	3.28312E-06			2.55335E-06	0.000598414	8.93051E-06				
	Total Hazard Index	HI	mg/kg-d										3.28E-05		0%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	POE concentration	C <sub>w</sub>	mg/m3	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.99068E-06	1.70799E-05	1.84542E-06	7.12166E-05	3.88915E-05	5.06301E-05	0.000143249	3.20914E-06				
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01			7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01				
	Risk	R	fraction	3.64E-06			4.99E-04	4.67E-06	2.73E-05	2.86E-06	2.31E-06				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										7.96E-04		11%
	Average intake from ingestion non-carcinogens	I <sub>nc</sub>	mg/kg-d	1.45562E-05	4.98164E-05	5.38247E-06	0.000207715	0.000113433	0.000147671	0.000417808	0.00000936				
	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		0.002490822	0.010764932		0.003781114	0.014767123	1.392694064	0.00312				
	Total Hazard Index	HI	mg/kg-d										3.85E-03		13%
Dermal contact with tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>abs</sub>	mg/cm2-event	1.35781E-06	1.33267E-07	1.61033E-09	2.81779E-08	5.88223E-06	3.61079E-07	2.84781E-07	2.01884E-09				
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	0.000114789	1.12664E-05	1.36137E-07	2.38216E-06	0.000471922	3.05257E-05	2.40754E-05	1.70673E-07				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01			1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01				
	Risk	R	fraction	2.64E-05			4.29E-06	5.66E-05	1.65E-05	7.22E-08	1.23E-07				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										5.38E-05		73%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000334801	3.28603E-05	3.97067E-07	6.94796E-06	0.001376441	8.90332E-05	7.022E-05	4.97795E-07				
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04	3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		0.001643016	0.000794134		0.045881353	0.008903317	1.560445485	0.000165932				
	Total Hazard Index	HI	mg/kg-d										1.35E+01		26%
Vapors from tap water [3/mol, those with a "Y"]	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313	1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164				
	Volatilization factor	VF	dimensionless												
	POE concentration	C <sub>air</sub>	mg/m3	0	0.00090915	0.00009823	0	0	0.002695	0.007625	0.00017082				
	Inhalation rate	IR	m3/hr												
	Exposure time	ET	h/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average intake from inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0	8.5058E-05	9.19018E-06	0	0	0.000252138	0.000713378	1.59815E-05				



TABLE 7-27  
RME RISK CALCULATIONS FOR ADULT RESIDENT (MODERATE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

							Chemicals of Potential Concern																					
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2-Dichloroethane	1,2,4-Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Acroton-1016	Acroton-1221				
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01				
				Risk	R	fraction		4.66E-07	4.12E-07				1.16E-06			5.11E-05	0.00E+00						4.28E-06	0.00E+00				
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		6.70117E-06	2.10715E-05	0.000883984	0.001496729	0.008257249	3.70348E-05	1.97945E-05	0.006001923	0.006770071	0	0	0	0.000256641	0	0	3.12444E-05	0				
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01												
				Hazard Quotient	HQ	mg/kg-d						7.243201154	0.026453448	0.017363576		0.029435092												
				Total Hazard Index	HI	mg/kg-d																						
				POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				Water ingestion rate	IR	l/d	0.05	3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07				
				Exposure frequency	EF	d/y	52																					
Exposure duration	ED	y	24																									
Body weight	BW	kg	70																									
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	8,760																									
				Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d		1.35073E-12	5.12897E-12	1.78182E-10	5.87834E-09	1.19172E-10	9.00928E-12	4.8153E-12	9.67277E-09	1.16094E-08	2.81642E-12	3.68138E-11	3.87972E-12	5.17302E-11	4.33959E-12	2.78768E-12	1.49188E-14	8.65222E-15				
				Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01				
				Risk	R	fraction		2.70E-13	2.92E-13				8.20E-13	3.27E-13		2.79E-10	3.10E-14	2.50E-11	2.40E-11		1.95E-12		5.99E-15	3.46E-15				
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
				Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d		3.93964E-12	1.49507E-11	5.19697E-10	1.71452E-08	3.47586E-10	2.62771E-11	1.40446E-11	2.82122E-08	3.38614E-08	8.21457E-12	1.07373E-10	1.13159E-11	1.5088E-10	1.26571E-11	8.13075E-12	4.35131E-14	2.52357E-14				
				Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05					
				Hazard Quotient	HQ	mg/kg-d		6.56607E-11	3.73769E-09	5.19697E-09	1.71452E-06	3.47586E-08	1.31385E-09	1.27678E-08	9.40408E-07	1.12871E-06	8.21457E-08	5.36867E-08	1.13159E-08	3.0176E-08		8.13075E-08	6.21616E-10					
				Total Hazard Index	HI	mg/kg-d																						
								POE concentration	C <sub>w</sub>	ug/l		3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
								event duration	t <sub>event</sub>	hr	2																	
absorbed dose per event	D <sub>event</sub>	mg/cm2-event						1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13				
Event frequency	EV	events/day	1																									
Exposure duration	ED	y	24																									
Exposure frequency	EF	d/y	52																									
Skin surface area	SA	cm2	18,000																									
Body weight	BW	kg	70																									
Averaging time	AT	d/y	25,550																									
Averaging time non-carcinogens	AT <sub>nc</sub>	d	8,760																									
				Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		1.27222E-11	3.76733E-11	1.18295E-09	4.4227E-08	1.17139E-08	3.73727E-11	3.88048E-11	6.77847E-07	5.90347E-07	1.60228E-10	1.69953E-10	0	4.59884E-10	1.30832E-10	1.42646E-11	0	1.88271E-12				
				Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01				
				Risk	R	fraction		2.54E-12	2.15E-12				3.40E-12	2.64E-12		1.42E-08	1.76E-12	1.36E-10	0.00E+00		5.89E-11		0.09E+00	7.53E-13				
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
				Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d		3.71064E-11	1.0988E-10	3.45026E-09	1.28995E-07	3.41655E-08	1.09004E-10	1.13181E-10	1.97705E-06	1.72185E-06	4.67332E-10	4.95697E-10	0	1.34133E-09	3.81594E-10	4.16049E-11	0	5.49125E-12				
				Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05					
				Hazard Quotient	HQ	mg/kg-d		6.1844E-10	2.74701E-08	3.45026E-08	1.28995E-05	3.41655E-06	5.45018E-09	1.02891E-07	6.99018E-05	5.73949E-05	4.67332E-06	2.47848E-07	0	2.68266E-07		4.16049E-07	0					
				Total Hazard Index	HI	mg/kg-d																						
				Carcinogenic risk - all routes (detected organics)																								
				Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction		5.71E-07	5.03E-07	0.00E+00	0.00E+00	0.00E+00	1.40E-06	1.02E-07	0.00E+00	4.98E-05	1.87E-08	7.60E-06	8.88E-06	0.00E+00	9.38E-07	0.00E+00	5.15E-06	1.94E-06					
Non-Carcinogenic risk - all routes (detected organics)																												
Non-Carcinogenic risk - all routes (undetected organics)																												
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction		2.52714E-05	0.001157468	0.001915364	0.032748781	7.629408459	0.026880996	0.021362187	0.077382249	0.105197103	0.049551913	0.016138616	0.003865765	0.011474335	0	0.029684879	0.089628181	0					

Notes  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event



TABLE 7-27  
RME RISK CALCULATIONS FOR ADULT RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																						
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)fluoranthene	Benz(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloroisopropyl) Ether	Bis (2-ethylhexyl) phthalate	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene	
Inhalation	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02								
	Risk	R	fraction	0.00E+00	1.71E-06	0.00E+00	1.89E-06	7.71E-05	9.67E-05	0.00E+00	0.00E+00	1.33E-05	0.00E+00	3.05E-04				1.07E-07				8.10E-02	3.08E-01	7.70E-02	1.61E+00	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		4.61E-05	0.00E+00	2.46E-06	5.11E-05		
	Average intake from inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	1.24978E-05	0	1.37475E-05	0.000562399	0.010332477	0	0	0.000125821	0	0.000766238	0	0	0.000319266	5.98828E-06	0.39583223	2.61798E-05	0.001660182	0	0.000103106	9.31083E-05	9.24834E-05	
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03											1.70E-02						
Incidental Ingestion of creek water	Hazard Quotient	HQ	mg/kg-d					1.205656559											23.28424883							
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	Water ingestion rate	IR	l/d																							
Incidental Ingestion of creek water	Exposure frequency	EF	d/y																							
	Exposure duration	ED	y																							
	Body weight	BW	kg																							
	Averaging time carcinogens	AT <sub>c</sub>	d																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
Incidental Ingestion of creek water	Average intake from ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.04423E-14	5.96706E-15	3.87859E-15	6.56376E-15	2.68518E-13	1.27302E-10	4.23661E-14	3.93826E-14	3.18851E-16	1.837E-16	1.86399E-10	2.70278E-11	7.16047E-12	7.76442E-11	1.20704E-12	4.74346E-08	6.36863E-12	4.03864E-10	1.70579E-16	4.92282E-14	4.44546E-14	1.39782E-13	
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
	Risk	R	fraction	4.18E-15	2.39E-15	1.55E-15	2.63E-15	1.07E-13	7.00E-12	3.09E-14	2.87E-13	2.33E-16	1.34E-17	2.05E-10		1.00E-13	4.82E-12	1.57E-13		5.35E-13		1.25E-15		3.47E-15	2.24E-13	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Average intake from ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	3.04569E-14	1.74039E-14	1.13125E-14	1.91443E-14	7.83176E-13	3.71297E-10	1.23568E-13	1.14866E-13	9.29983E-16	5.35793E-16	5.43663E-10	7.88312E-11	2.08847E-11	2.26521E-10	3.52053E-12	1.38351E-07	1.85752E-11	1.17794E-09	4.97522E-16	1.43582E-13	1.29659E-13	4.07698E-13	
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	2.00E-02	2.00E-02	7.00E-04	2.00E-02	2.00E-02	1.00E-02		4.00E-03	2.00E-04	8.00E-04	
	Hazard Quotient	HQ	mg/kg-d				9.57215E-10		9.28242E-08						1.97078E-09	1.04423E-09	1.1326E-08	5.02933E-09	6.91754E-06	9.28758E-10	1.17794E-07		3.58956E-11	6.48296E-10	5.09623E-10	
	Total Hazard Index	HI	mg/kg-d																							
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537	0.011575497	4.88911E-09	1.41097E-06	1.27415E-06	4.00642E-06	
	event duration	t <sub>event</sub>	hr																							
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12	2.34503E-10	3.40744E-14	5.24028E-13	6.38038E-13	3.86609E-12	
	Event frequency	EF	events/day																							
	Exposure duration	ED	y																							
	Exposure frequency	EF	d/y																							
	Skin surface area	SA	cm2																							
Dermal contact with creek water	Body weight	BW	kg																							
	Averaging time	AT	d/y																							
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																							
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	2.27224E-12	9.93714E-12	6.9289E-12	1.86136E-11	4.75552E-09	1.7149E-09	3.9922E-11	6.36248E-11	5.22726E-13	2.96857E-13	3.98954E-10	1.94782E-09	8.1979E-10	4.74415E-10	2.50156E-11	1.35339E-06	3.61698E-11	2.94541E-09	4.27983E-13	6.58192E-12	8.01392E-12	4.8559E-11	
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00		1.40E-02	6.20E-02	1.30E-01		8.40E-02		7.30E+00		7.80E-02	1.60E+00	
Dermal contact with creek water	Risk	R	fraction	9.09E-13	3.97E-12	2.77E-12	7.45E-12	1.90E-09	9.43E-11	9.38E-12	1.50E-10	1.20E-14	2.17E-14	4.39E-10		1.15E-11	2.94E-11	3.25E-12		3.04E-12		3.12E-12		6.25E-13	7.77E-11	
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																							
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	6.62737E-12	2.89633E-11	2.02093E-11	5.42897E-11	1.38703E-08	5.0018E-09	1.16439E-10	1.85572E-10	1.52462E-12	8.65833E-13	1.16362E-09	5.68114E-09	2.39105E-09	1.38429E-09	7.29622E-11	3.94738E-06	1.05495E-10	8.59079E-09	1.24828E-12	1.91973E-11	2.33739E-11	1.4163E-10	
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d				2.00E-05		4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02	2.00E-03		4.00E-03	2.00E-04	8.00E-04	
	Hazard Quotient	HQ	mg/kg-d				2.71449E-06		1.25045E-06						1.42028E-07	6.29225E-07	6.92147E-08	1.04232E-07	0.000636674	5.27476E-09	4.2954E-06		4.79931E-09	1.1687E-07	1.77038E-07	
Dermal contact with creek water	Total Hazard Index	HI	mg/kg-d																							
	Carcinogenic risk - all routes (detected organics)																									
	Carcinogenic risk - all routes (undetected organics)																									
	TOTAL CARCINOGENIC RISK - ALL ROUTES	Sum R <sub>t</sub>	fraction	2.37E-06	9.77E-06	5.60E-06	1.67E-05	3.79E-03	1.42E-04	2.27E-05	3.32E-04	2.40E-05	8.29E-06	3.64E-04	0.00E+00	3.67E-05	1.47E-06	1.75E-07	0.00E+00	1.63E-07	4.62E-05	1.18E-03	0.00E+00	4.17E-06	1.09E-04	
	Non-Carcinogenic risk - all routes (detected organics)																									
	Non-Carcinogenic risk - all routes (undetected organics)																									
	TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES	Sum H <sub>i</sub>	fraction	0	0	0	5.407687156	0	1.803352269	0	0	0	0	0	0	0.001099049	1.372095534	0.003469286	0.002185746	31.9099987	0.000282933	0.048544432	0	0.014492982	0.320362308	0.131781645



TABLE 7-27  
RME RISK CALCULATIONS FOR ADULT RESIDENT (MODERATE TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern										Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indeno(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosod-n-propylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride			
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	2.00E-02	3.00E-02			
	Risk	R	fraction	0.00E+00						5.29E-04	1.43E-05	4.79E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.28E-06		16%
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	0.000248086	2.68047E-05	0	0	0.000735403	0.002080685	4.66128E-05				
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04			1.40E-01	1.14E-02	2.86E-02				
	Hazard Quotient	HQ	mg/kg-d		0.289481754	0.046943397			0.005252877	0.182516222	0.001629818				
	Total Hazard Index	HI	mg/kg-d										2.28E-01		61%
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09						0.000841116	0.029336582	0.000325004			
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09						0.000841116	0.029336582	0.000325004			
	Water ingestion rate	IR	l/d		0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.837E-16	5.00059E-11	5.40294E-12	2.51638E-10	2.69711E-13	2.93462E-11	1.02354E-09	1.13393E-11				
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	7.30E-01			7.00E+00	1.20E-01	5.40E-01	2.00E-02	7.20E-01				
	Risk	R	fraction	1.34E-16			1.76E-09	3.24E-14	1.58E-11	2.05E-11	8.16E-12				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										2.34E-09		0%
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	5.35793E-16	1.45851E-10	1.57586E-11	7.33945E-10	7.86657E-13	8.5993E-11	2.98533E-09	3.30728E-11				
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		7.29253E-09	3.15171E-08		2.62219E-11	8.5993E-09	9.95109E-06	1.10243E-08				
	Total Hazard Index	HI	mg/kg-d										2.18E-02		0%
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09						0.000841116	0.029336582	0.000325004			
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>aevent</sub>	mg/cm2-event	2.49869E-14											
	Event frequency	EF	events/day		2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12				
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.13842E-13	2.51624E-09	3.17365E-11	6.6307E-10	2.43095E-10	1.31422E-09	1.33966E-08	5.60291E-11				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01			1.80E+00	1.20E-01	5.40E-01	3.00E-03	7.20E-01				
	Risk	R	fraction	7.22E-14			1.19E-09	2.92E-11	7.10E-10	4.02E-11	4.03E-11				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.91E-08		0%
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	9.15373E-13	7.33902E-09	9.25649E-11	1.93395E-09	7.09027E-10	3.83315E-09	3.90735E-08	1.63418E-10				
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		3.66951E-07	1.8513E-07		2.36342E-08	3.83315E-07	0.000868301	5.44727E-08				
	Total Hazard Index	HI	mg/kg-d										1.66E-06		0%
Carcinogenic risk - all routes (detected organics)														5.54E-03	
Carcinogenic risk - all routes (undetected organics)														1.82E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES														7.37E-03	
Non-Carcinogenic risk - all routes (detected organics)														4.65E+01	
Non-Carcinogenic risk - all routes (undetected organics)														6.14E+00	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES														6.27E+01	
				Sum R <sub>t</sub>	fraction	3.00E-05	0.00E+00	0.00E+00	5.03E-04	6.13E-05	5.74E-04	1.73E-05	2.92E-06		
				Sum H <sub>i</sub>	fraction	0	0.293703529	0.058505962	0	0.04966249	0.028926282	3.137132437	0.004924746		



TABLE 7-28

**RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)**  
Missouri Electric Works, Cape Girardeau

								Chemicals of Potential Concern																			
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	Total 1,2 Dichloroethene	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,4-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221			
Groundwater	Air	Indoor air	Vapour intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3		7.59E-06	9.30E-05	2.27E-03	7.42E-03	4.09E-03	1.92E-04	1.06E-04	8.90E-03	6.16E-03	0.00E+00	0.00E+00	0.00E+00	3.06E-04	0.00E+00	0.00E+00	6.76E-08	0.00E+00			
				POE concentration	C <sub>soil</sub>	mg/m3		7.59E-09	9.30E-08	2.27E-06	7.42E-06	4.09E-06	1.92E-07	1.06E-07	8.90E-06	6.16E-06	0.00E+00	0.00E+00	0.00E+00	3.06E-07	0.00E+00	0.00E+00	6.76E-11	0.00E+00			
				Inhalation rate	IR	m3/hr	0.83																				
				Exposure time	ET	h/d	24																				
				Exposure frequency	EF	d/y	350																				
				Exposure duration	ED	y	24																				
				Body weight	BW	kg	70																				
				Averaging time carcinogens	AT <sub>c</sub>	d	25,550																				
				Averaging time non-carcinogens	AT <sub>n</sub>	d	8,760																				
				Average intake from inhalation carcinogens	I <sub>a</sub>	mg/kg-d		7.10103E-10	8.70087E-09	2.12376E-07	6.94198E-07	3.82651E-07	1.79631E-08	9.91712E-09	8.32664E-07	5.76316E-07	0	0	0	2.86287E-08	0	0	6.3245E-12	0			
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02			0	0	2.86287E-08	0	0	4.00E-01	4.00E-01	
				Risk	R <sub>i</sub>	fraction		1.44E-10	4.96E-10				1.63E-09			1.27E-08	0.00E+00							2.53E-12	0.00E+00		
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																					
				Average intake from inhalation non-carcinogens	I <sub>a</sub>	mg/kg-d		2.07113E-09	2.53775E-08	6.1943E-07	2.02475E-06	1.11607E-06	5.23923E-08	2.89249E-08	2.4284E-06	1.68092E-06	0	0	0	8.35003E-08	0	0	1.84465E-11	0			
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01											
				Hazard Quotient	HQ	mg/kg-d						0.000979005	3.74231E-05	2.53727E-05		7.30835E-06											
				Total Hazard Index	HI	mg/kg-d																					
				Groundwater	Tap Water		Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229
POE concentration	C <sub>w</sub>	mg/m3						0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282			
Water ingestion rate	IR	l/d	2																								
Exposure frequency	EF	d/y	350																								
Exposure duration	ED	y	24																								
Body weight	BW	kg	70																								
Averaging time carcinogens	AT <sub>c</sub>	d	25,550																								
Averaging time non-carcinogens	AT <sub>n</sub>	d	8,760																								
Average intake from ingestion carcinogens	I <sub>a</sub>	mg/kg-d						4.61354E-07	1.45071E-06	6.08595E-05	0.000103045	0.000568485	2.54973E-06	1.36279E-06	0.000413213	0.000466098	9.61973E-07	1.04187E-05	1.3254E-06	1.76689E-05	1.48222E-06	9.52157E-07	2.15108E-06	1.24762E-06			
Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg						2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00			4.50E-01	4.00E-01	4.00E-01			
Risk	R <sub>i</sub>	fraction						9.23E-08	8.27E-08				2.32E-07	9.27E-08		1.12E-05	1.06E-08	7.08E-06	8.88E-06			6.67E-07	8.60E-07	4.99E-07			
Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																									
Average intake from ingestion non-carcinogens	I <sub>a</sub>	mg/kg-d						1.34562E-06	4.23123E-06	0.000177507	0.000300548	0.001698082	7.43671E-06	3.97479E-06	0.001205205	0.001359452	2.80575E-06	3.03879E-05	3.86575E-06	5.15342E-05	4.32315E-06	2.77712E-06	6.27397E-06	3.6389E-06			
Ingestion Reference Dose	RfD <sub>o</sub>	mg/kg-d						6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-04	2.00E-03	1.00E-03	2.00E-03	1.00E-03	5.00E-03	1.00E-04	1.00E-04	7.00E-05			
Hazard Quotient	HQ	mg/kg-d						2.24269E-05	0.001057808	0.001775068	0.030054795	0.165808219	0.000371836	0.00361345	0.040173516	0.045315068	0.028057534	0.015193973	0.003865753	0.010306849		0.027771233	0.08962818				
Total Hazard Index	HI	mg/kg-d																									
		Dermal contact with tap water	POE concentration					C <sub>w</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282
			event duration					t <sub>event</sub>	hr	0.58																	
			absorbed dose per event	D <sub>event</sub>	mg/cm2-event		6.91995E-10	1.61619E-09	5.68815E-08	1.08663E-07	8.89856E-06	1.48291E-09	1.60454E-09	4.51893E-06	3.69637E-06	8.71524E-09	7.65966E-09		0	2.3668E-08	7.11633E-09	7.75888E-10		0			
			Event frequency	EV	events/day	1																					
			Exposure duration	ED	y	24																					
			Exposure frequency	EF	d/y	350																					
			Skin surface area	SA	cm2	18,000																					
			Body weight	BW	kg	70																					
			Averaging time	AT	d/y	25,550																					
			Averaging time non-carcinogens	AT <sub>n</sub>	d	8,760																					
			Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d		5.85013E-08	1.36633E-07	4.80877E-06	9.18642E-06	0.000752286	1.25366E-07	1.35648E-07	0.000382031	0.000312491	7.36787E-07	6.47549E-07	0	2.00089E-06	6.01615E-07	6.59937E-08	0	3.65493E-06				
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg		2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	8.00E-01	6.70E+00			4.50E-01	4.00E-01	4.00E-01				
			Risk	R <sub>i</sub>	fraction		1.17E-08	7.79E-09				1.14E-08	9.22E-09		7.50E-06	8.10E-09	5.18E-07	0.00E+00			2.71E-07	0.00E+00	1.46E-06				
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																						
			Absorbed dose for non-carcinogens	DAD <sub>der</sub>	mg/kg-d		1.70629E-07	3.98513E-07	1.40256E-05	2.67937E-05	0.002194166	3.65649E-07	3.95641E-07	0.001114257	0.000911433	2.14896E-06	1.88868E-06	0	5.83594E-06	1.75471E-06	1.91315E-07	0	1.06602E-05				
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	1.00E-04	2.00E-03	1.00E-03	2.00E-03	1.00E-03	5.00E-03	1.00E-04	1.00E-04	7.00E-05				
			Hazard Quotient	HQ	mg/kg-d		2.84381E-06	9.96282E-05	0.000140256	0.002679372	0.21941663	1.82825E-05	0.000359673	0.037141891	0.03038111	0.021489623	0.000944342	0	0.001167187		0.001913149	0					
			Total Hazard Index	HI	mg/kg-d																						
Air	Indoor Air	Vapors from tap water	Concentration in tap water	C <sub>w</sub>	ug/l		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282				
			Concentration in tap water	C <sub>w</sub>	mg/m3		0.049115	0.15444	6.479	10.97	60.52	0.27144	0.14508	43.99	49.62	0.10241	1.10916	0.1411	1.881	0.157795	0.101365	0.229	0.13282				
			Volatilization factor	VF	dimensionless	0.0005 y																					
			POE concentration	C <sub>air</sub> <sub>exp</sub>	mg/m3		2.45575E-05 y	0.00007722 y	0.0032395 y	0.005485 y	0.03026 y	0.00013572 y	0.00007254 y	0.021995 y	0.02481 y	0	0	0	0.0009405 y	0	0	0.0001145 y	0				
			Inhalation rate	IR	m3/hr	0.83																					
			Exposure time	ET	h/d	24																					
			Exposure frequency	EF	d/y	350																					
			Exposure duration	ED	y	24																					
			Body weight	BW	kg	70																					
			Averaging time carcinogens	AT <sub>c</sub>	d	25,550																					
			Averaging time non-carcinogens	AT <sub>n</sub>	d	8,760																					
			Average intake from inhalation carcinogens	I <sub>a</sub>	mg/kg-d		2.29754E-06	7.22453E-06	0.00030308	0.000513164	0.002831057	1.26977E-05	6.78668E-06	0.002057802	0.002321167	0	0	0	8.7991E-05	0	0	1.07124E-05	0				



TABLE 7-28  
RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern																					
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroform	Dibenz(a,h)Anthracene	Dibenzofuran	Hexachloro-1,3-Butadiene	Hexachlorobenzene
Vapour intrusion - Inhalation	POE concentration	$C_{air}$	ug/m3	0.00E+00	3.48E-08	0.00E+00	5.00E-08	2.08E-06	2.17E-03	0.00E+00	0.00E+00	5.21E-08	0.00E+00	4.11E-04	0.00E+00	0.00E+00	1.20E-03	3.04E-05	1.52E+00	9.87E-05	1.13E-02	0.00E+00	3.25E-04	7.48E-07	1.20E-06
	POE concentration	$C_{air}$	mg/m3	0.00E+00	3.48E-11	0.00E+00	5.00E-11	2.08E-09	2.17E-06	0.00E+00	0.00E+00	5.21E-11	0.00E+00	4.11E-07	0.00E+00	0.00E+00	1.20E-06	3.04E-08	1.52E-03	9.87E-08	1.13E-05	0.00E+00	3.25E-07	7.48E-10	1.20E-09
	Inhalation rate	IR	m3/hr																						
	Exposure time	ET	h/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	$AT_c$	d																						
	Averaging time non-carcinogens	$AT_n$	d																						
	Average Intake from Inhalation carcinogens	$I_c$	mg/kg-d		3.25581E-12	0	4.67789E-12	1.946E-10	2.0302E-07	0	0	4.87436E-12	0	3.84522E-08	0	0	1.12269E-07	2.84415E-09	0.000142208	9.23415E-09	1.0572E-06	0	3.04063E-08	6.99812E-11	1.12269E-10
Inhalation Cancer Slope Factor	$CSF_{inh}$	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00			5.20E-02				8.10E-02	3.08E-01	7.70E-02	1.61E+00	
Risk	R	fraction		0.00E+00	1.30E-12	0.00E+00	1.87E-12	7.78E-11	5.54E-09	0.00E+00	0.00E+00	1.50E-12	0.00E+00	4.46E-08			1.48E-10				8.56E-08	0.00E+00	5.39E-12	1.81E-10	
Total carcinogenic risk for exposure route	$R_t$	fraction																							
Average Intake from Inhalation non-carcinogens	$I_n$	mg/kg-d		9.49611E-12	0	1.36438E-11	5.67584E-10	5.92142E-07	0	0	1.42169E-11	0	1.12152E-07	0	0	3.27452E-07	8.29545E-09	0.000414773	2.69329E-08	3.08351E-06	0	8.86849E-08	2.04112E-10	3.27452E-10	
Inhalation Reference Dose	$RfD_{inh}$	mg/kg-d																1.70E-02							
Hazard Quotient	HQ	mg/kg-d																0.024398388							
Total Hazard Index	HI	mg/kg-d																							
Ingestion of tap water	POE concentration	$C_w$	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	POE concentration	$C_w$	mg/m3	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	Water Ingestion rate	IR	l/d																						
	Exposure frequency	EF	d/y																						
	Exposure duration	ED	y																						
	Body weight	BW	kg																						
	Averaging time carcinogens	$AT_c$	d																						
	Averaging time non-carcinogens	$AT_n$	d																						
	Average Intake from Ingestion carcinogens	$I_c$	mg/kg-d		8.60431E-07	5.5928E-07	9.46474E-07	3.87194E-05	0.000711358	6.10906E-06	5.67884E-06	8.6624E-06	4.99068E-06	5.2753E-05	7.64919E-06	0.001032517	2.19804E-05	4.12274E-07	0.0227251789	1.8024E-06	0.000114298	4.63421E-06	7.09855E-06	6.41021E-06	6.36719E-06
	Ingestion Cancer Slope Factor	$CSF_{ing}$	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00			1.40E-02	6.20E-02	1.30E-01		8.40E-02	7.30E+00	7.80E-02	1.60E+00
Risk	R	fraction		6.02E-07	3.44E-07	2.24E-07	3.79E-07	1.55E-05	3.91E-05	4.46E-06	4.15E-05	6.32E-06	3.64E-07	5.80E-05			1.45E-05	1.36E-06	5.36E-08		1.51E-07	3.38E-05	5.00E-07	1.02E-05	
Total carcinogenic risk for exposure route	$R_t$	fraction																							
Average Intake from Ingestion non-carcinogens	$I_n$	mg/kg-d		2.50959E-06	1.63123E-06	2.76055E-06	0.000112932	0.002074795	1.78181E-05	1.65633E-05	2.52653E-05	1.45562E-05	0.000153863	2.23101E-05	0.003011507	6.41096E-05	1.20247E-06	0.079484384	5.25699E-06	0.000333337	1.35164E-05	2.07041E-05	1.86964E-05	1.8571E-05	
Ingestion Reference Dose	$RfD_{ing}$	mg/kg-d																2.00E-02	2.00E-02	2.00E-02	1.00E-02	4.00E-03	2.00E-04	8.00E-04	
Hazard Quotient	HQ	mg/kg-d																0.000557753	0.150575342	0.003205479	0.001717808	3.974219178	0.000262849	0.033336786	0.005176027
Total Hazard Index	HI	mg/kg-d																							
Dermal contact with tap water	POE concentration	$C_w$	ug/l	0.1603	0.0916	0.05954	0.10076	4.122	75.73	0.65036	0.60456	0.922185	0.5313	5.616	0.81432	109.92	2.34	0.04389	2901.18	0.19188	12.168	0.49335	0.7557	0.68242	0.67784
	event duration	$t_{event}$	hr																						
	absorbed dose per event	$D_{event}$	mg/cm2-event	5.21778E-08	2.28188E-07	1.59109E-07	4.27428E-07	0.000109202	1.28037E-06	9.16736E-07	1.46103E-06	2.26152E-06	1.28432E-06	1.72638E-08	8.77868E-08	1.8825E-05	2.13911E-08	1.32811E-09	0.00011633	1.63014E-09	1.2333E-07	1.85163E-06	1.51142E-07	1.84025E-07	3.52242E-07
	Event frequency	EF	events/day																						
	Exposure duration	ED	y																						
	Exposure frequency	EF	d/y																						
	Skin surface area	SA	cm2																						
	Body weight	BW	kg																						
	Averaging time	AT	d/y																						
	Averaging time non-carcinogens	$AT_n$	d																						
Absorbed dose for carcinogens	$DAD_c$	mg/kg-d		1.92911E-05	1.34511E-05	3.61348E-05	0.009231943	0.000108242	7.7501E-05	0.000123515	0.000191189	0.000108577	1.45949E-06	7.4215E-06	0.001591465	1.8084E-06	1.12279E-07	0.009834593	1.37813E-07	1.04263E-05	0.000156537	1.2777E-05	1.55575E-05	2.97786E-05	
Dermal Cancer Slope Factor	$CSF_{der}$	kg-d/mg		4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00			1.40E-02	6.20E-02	1.30E-01		8.40E-02	7.30E+00	7.80E-02	1.60E+00	
Risk	R	fraction		1.76E-06	7.72E-06	5.38E-06	1.45E-05	3.67E-03	5.95E-06	1.82E-05	2.90E-04	4.40E-06	7.												



TABLE 7-28  
RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern									Total	% Contribution
Exposure Route	Parameter	Symbol	Units	Indena(1,2,3-cd)Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosod-n-propylamine	Perchlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride		
Vapour Intrusion - Inhalation	POE concentration	C <sub>air</sub>	ug/m3	0.00E+00		2.75E-04	6.87E-06	0.00E+00	0.00E+00	1.31E-03	2.50E-02	9.36E-04		
	POE concentration	C <sub>air</sub>	mg/m3	0.00E+00		2.75E-07	6.87E-09	0.00E+00	0.00E+00	1.31E-06	2.50E-05	9.36E-07		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0		2.57284E-08	6.42742E-10	0	0	1.22561E-07	2.33894E-06	8.757E-08		
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02		
	Risk	R <sub>i</sub>	fraction	0.00E+00						2.57E-07	1.40E-08	2.63E-09	4.28E-07	0%
Ingestion of tap water	POE concentration	C <sub>w</sub>	ug/l	0.5313		1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	POE concentration	C <sub>w</sub>	mg/m3	0.5313		1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Water Ingestion rate	IR	l/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average Intake from Ingestion carcinogens	I <sub>c</sub>	mg/kg-d	4.99068E-06		1.70799E-05	1.84542E-06	7.12166E-05	3.88915E-05	5.06301E-05	0.000143249	3.20914E-06		
	Ingestion Cancer Slope Factor	CSF <sub>o</sub>	kg-d/mg	7.30E-01				7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01		
	Risk	R <sub>i</sub>	fraction	3.64E-06				4.99E-04	4.67E-06	2.73E-05	8.59E-07	2.31E-06	7.54E-06	11%
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction											
	Average Intake from Ingestion non-carcinogens	I <sub>c</sub>	mg/kg-d	1.45562E-05		4.98164E-05	5.38247E-06	0.000207715	0.000113433	0.000147671	0.000417808	0.00000936		
Dermal contact with tap water	Ingestion Reference Dose	RfD <sub>sw</sub>	mg/kg-d			2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d			0.002490822	0.010764932		0.003781114	0.014767123	1.392694064	0.00312	4.38E-05	13%
	Total Hazard Index	HI	mg/kg-d											
	POE concentration	C <sub>w</sub>	ug/l	0.5313		1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	event duration	t <sub>event</sub>	hr											
	absorbed dose per event	D <sub>oevent</sub>	mg/cm2-event	1.35781E-06		1.33267E-07	1.61033E-09	2.81779E-08	5.58223E-06	3.61079E-07	2.84781E-07	2.01884E-09		
	Event frequency	EV	events/day											
	Exposure duration	ED	y											
	Exposure frequency	EF	d/y											
	Skin surface area	SA	cm2											
	Body weight	BW	kg											
	Averaging time	AT	d/y											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
Vapors from tap water	Absorbed dose for carcinogens	DAD <sub>o</sub>	mg/kg-d	0.000114789		1.12664E-05	1.36137E-07	2.38216E-06	0.000471922	3.05257E-05	2.40754E-05	1.70673E-07		
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01				1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01		
	Risk	R <sub>i</sub>	fraction	2.64E-05				4.29E-06	5.66E-05	1.65E-05	2.17E-08	1.23E-07	5.38E-06	73%
	Total carcinogenic risk for exposure route	R <sub>i</sub>	fraction											
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	0.000334801		3.28603E-05	3.97067E-07	6.94796E-06	0.001376441	8.90332E-05	7.022E-05	4.97795E-07		
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		4.00E-03	2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03		
	Hazard Quotient	HQ	mg/kg-d			0.001643016	0.000794134		0.045881353	0.008903317	1.560445485	0.000165932	1.38E+01	26%
	Total Hazard Index	HI	mg/kg-d											
	Concentration in tap water	C <sub>w</sub>	ug/l	0.5313		1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Concentration in tap water	C <sub>w</sub>	mg/m3	0.5313		1.8183	0.19646	7.5816	4.14032	5.39	15.25	0.34164		
	Volatilization factor	VF	dimensionless	0	Y	Y	Y	Y	Y	Y	Y	Y		
13/mol, those with a "Y")	POE concentration	C <sub>air</sub>	mg/m3	0		0.00090915	0.00009823	0	0	0.002695	0.007625	0.00017082		
	Inhalation rate	IR	m3/hr											
	Exposure time	ET	h/d											
	Exposure frequency	EF	d/y											
	Exposure duration	ED	y											
	Body weight	BW	kg											
	Averaging time carcinogens	AT <sub>c</sub>	d											
	Averaging time non-carcinogens	AT <sub>nc</sub>	d											
	Average Intake from Inhalation carcinogens	I <sub>c</sub>	mg/kg-d	0		8.5058E-05	9.19018E-06	0	0	0.000252138	0.000713378	1.59815E-05		



TABLE 7-28  
RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

							Chemicals of Potential Concern																	
Source Medium	Exposure Medium	Exposure Point	Exposure Route	Parameter	Symbol	Units	Non Contaminant-Specific Parameters	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	Total 1,2 Dichloroethane	1,2,4 Trichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chlorophenol	3,3-Dichlorobenzidine	4,6-Dinitro-2-Methyl Phenol	Aroclor-1016	Aroclor-1221
				Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg		2.03E-01	5.70E-02				9.10E-02			2.20E-02	1.09E-02						4.00E-01	4.00E-01
				Risk	R	fraction		4.66E-07	4.12E-07				1.16E-06			5.11E-05	0.00E+00						4.28E-06	0.00E+00
				Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																		
				Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d		6.70117E-06	2.10715E-05	0.000883984	0.001496729	0.008257249	3.70348E-05	1.97945E-05	0.006001923	0.006770071	0	0	0	0.000256641	0	0	3.12444E-05	0
				Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						1.14E-03	1.40E-03	1.14E-03		2.30E-01								
				Hazard Quotient	HQ	mg/kg-d						7.243201154	0.026453448	0.017363576		0.029435092								
				Total Hazard Index	HI	mg/kg-d																		
Surface Water	Creek	Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			POE concentration	C <sub>w</sub>	mg/m3			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			Water ingestion rate	IR	l/d		0.05																	
			Exposure frequency	EF	d/y		52																	
			Exposure duration	ED	y		24																	
			Body weight	BW	kg		70																	
			Averaging time carcinogens	AT <sub>c</sub>	d		25,550																	
			Averaging time non-carcinogens	AT <sub>nc</sub>	d		8,760																	
			Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d			1.35073E-12	5.12597E-12	1.78182E-10	5.87834E-09	1.19172E-10	9.00928E-12	4.8153E-12	9.67277E-09	1.16094E-08	2.81642E-12	3.68138E-11	3.87972E-12	5.17302E-11	4.33959E-12	2.78768E-12	1.49188E-14	8.65223E-15
			Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
			Risk	R	fraction			2.70E-13	2.92E-13				8.20E-13	3.27E-13		2.79E-10	3.10E-14	2.50E-11	2.60E-11		1.95E-12		5.97E-15	3.46E-15
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
			Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d			3.93964E-12	1.49507E-11	5.19697E-10	1.71452E-08	3.47586E-10	2.62771E-11	1.40446E-11	2.82122E-08	3.38614E-08	8.21457E-12	1.07373E-10	1.13159E-11	1.5088E-10	1.26571E-11	8.13075E-12	4.35131E-14	2.52357E-14
			Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
			Hazard Quotient	HQ	mg/kg-d			6.56607E-11	3.73769E-09	5.19697E-09	1.71452E-06	3.47586E-08	1.31385E-09	1.27678E-08	9.40408E-07	1.12871E-06	8.21457E-08	5.36867E-08	1.13159E-08	3.0176E-08		8.13075E-08	6.21616E-10	
			Total Hazard Index	HI	mg/kg-d																			
		Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l			3.87145E-05	0.00014692	0.005107025	0.168484251	0.003415705	0.000258223	0.000138016	0.277239592	0.332753253	8.07239E-05	0.001055151	0.0001112	0.001482685	0.000124381	7.99002E-05	4.276E-07	2.47989E-07
			event duration	t <sub>event</sub>	hr		2																	
			absorbed dose per event	D <sub>abs event</sub>	mg/cm2-event			1.01289E-12	2.99941E-12	9.41817E-11	3.52119E-09	9.32615E-10	2.97547E-12	3.08949E-12	5.39677E-08	4.70013E-08	1.27568E-11	1.3531E-11	0	3.66143E-11	1.04164E-11	1.13569E-12	0	1.49895E-13
			Event frequency	EF	events/day		1																	
			Exposure duration	ED	y		24																	
			Exposure frequency	EF	d/y		52																	
			Skin surface area	SA	cm2		18,000																	
			Body weight	BW	kg		70																	
			Averaging time	AT	d/y		25,550																	
			Averaging time non-carcinogens	AT <sub>nc</sub>	d		8,760																	
			Absorbed dose for carcinogens	DAD <sub>nc</sub>	mg/kg-d			1.27222E-11	3.76733E-11	1.18295E-09	4.4227E-08	1.17139E-08	3.73727E-11	3.88048E-11	6.77847E-07	5.90347E-07	1.60228E-10	1.69953E-10	0	4.59884E-10	1.30832E-10	1.42646E-11	0	1.88271E-12
			Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg			2.00E-01	5.70E-02				9.10E-02	6.80E-02		2.40E-02	1.10E-02	6.80E-01	6.70E+00		4.50E-01		4.00E-01	4.00E-01
			Risk	R	fraction			2.54E-12	2.15E-12				3.40E-12	2.64E-12		1.42E-08	1.76E-12	1.36E-10	0.00E+00		5.89E-11		0.00E+00	7.53E-13
			Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction																			
			Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d			3.71064E-11	1.0988E-10	3.45026E-09	1.28995E-07	3.41655E-08	1.09004E-10	1.13181E-10	1.97705E-06	1.72185E-06	4.67332E-10	4.95697E-10	0	1.34133E-09	3.81594E-10	4.16049E-11	0	5.49125E-12
			Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d			6.00E-02	4.00E-03	1.00E-01	1.00E-02	1.00E-02	2.00E-02	1.10E-03	3.00E-02	3.00E-02	1.00E-04	2.00E-03	1.00E-03	5.00E-03		1.00E-04	7.00E-05	
Hazard Quotient	HQ	mg/kg-d			6.1844E-10	2.74701E-08	3.45026E-08	1.28995E-05	3.41655E-06	5.45018E-09	1.02891E-07	6.59018E-05	5.73949E-05	4.67332E-06	2.47848E-07	0	2.68266E-07		4.16049E-07	0				
Total Hazard Index	HI	mg/kg-d																						
Carcinogenic risk - all routes (detected organics)																								
Carcinogenic risk - all routes (undetected organics)																								
TOTAL CARCINOGENIC RISK - ALL ROUTES				Sum R <sub>t</sub>	fraction			5.71E-07	5.03E-07	0.00E+00	0.00E+00	0.00E+00	1.40E-06	1.02E-07	0.00E+00	6.98E-05	1.87E-08	7.60E-06	8.88E-06	0.00E+00	9.38E-07	0.00E+00	5.15E-06	1.96E-06
Non-Carcinogenic risk - all routes (detected organics)																								
Non-Carcinogenic risk - all routes (undetected organics)																								
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES				Sum HI	fraction			2.52714E-05	0.001137468	0.001915364	0.032748781	7.629408459	0.026880996	0.021342187	0.077382249	0.105197103	0.049551913	0.016138616	0.003863765	0.011474335	0	0.029684879	0.089628181	0

Notes:  
1- ug/l = micrograms per liter  
2- ug/m3 = micrograms per cubic meter  
3- h/d = hours per day  
4- l/d = liters per day  
5- d/y = days per year  
6- y = year  
7- kg = kilogram  
8- d = day  
9- hr = hour  
10- mg/kg-d = milligrams per kilogram per day  
11- kg-d/mg = kilograms per day per milligram  
12- cm2 = square centimeter  
13- m3/hr = cubic meter per hour  
14- mg/m3 = milligrams per cubic meter  
15- mg/cm2-event = milligrams per square centimeter per event  
16- mg/cm3-event = milligrams per cubic centimeter per event

NEW Site File  
3DISC100278



TABLE 7-28  
RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

			Chemicals of Potential Concern																	
Exposure Route	Parameter	Symbol	Units	Aroclor-1222	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260 (Filtered)	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-Chloroethyl) Ether	Bis(2-Chloropropyl) Ether	Bis (2-ethylhexyl phthalate)	Bromodichloromethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane
Incidental ingestion of creek water	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	2.73E-02	3.08E-01	3.08E+00	3.08E-01	3.08E-01	1.16E+00				5.20E-02		
	Risk	R <sub>i</sub>	fraction	0.00E+00	1.71E-06	0.00E+00	1.89E-06	7.71E-05	9.67E-05	0.00E+00	0.00E+00	1.33E-05	0.00E+00	3.05E-04				1.07E-07		
	Total carcinogenic risk for exposure route		fraction																	
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	1.24978E-05	0	1.37475E-05	0.000562399	0.010332477	0	0	0.000125821	0	0.000766238	0	0	0.000319266	5.98828E-06	0.39583223	2.61798E-05
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d						8.57E-03									1.70E-02		
Dermal contact with creek water	Hazard Quotient	HQ	mg/kg-d						1.205656559									23.28424883		
	Total Hazard Index	HI	mg/kg-d																	
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537
	POE concentration	C <sub>w</sub>	mg/m3	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537
	Water Ingestion rate	IR	l/d																	
Incidental ingestion of creek water	Exposure frequency	EF	d/y																	
	Exposure duration	ED	y																	
	Body weight	BW	kg																	
	Averaging time carcinogens	AT <sub>c</sub>	d																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
Dermal contact with creek water	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.04423E-14	5.96706E-15	3.87859E-15	6.56376E-15	2.68518E-13	1.27302E-10	4.23661E-14	3.93826E-14	3.18851E-16	1.837E-16	1.86399E-10	2.70278E-11	7.16047E-12	7.76442E-11	1.20704E-12	4.74346E-08	6.36863E-12
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	7.30E-01	7.30E+00	7.30E-01	7.30E-02	1.10E+00				6.20E-02	1.30E-01	8.40E-02
	Risk	R <sub>i</sub>	fraction	4.18E-15	2.39E-15	1.55E-15	2.63E-15	1.07E-13	7.00E-12	3.09E-14	2.87E-13	2.33E-16	1.34E-17	2.05E-10				1.57E-13	5.35E-13	1.25E-15
	Total carcinogenic risk for exposure route		fraction																	
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	3.04569E-14	1.74039E-14	1.13125E-14	1.91443E-14	7.83176E-13	3.71297E-10	1.23568E-13	1.14866E-13	9.29983E-16	5.35793E-16	5.43663E-10	7.88312E-11	2.08847E-11	2.26521E-10	3.52053E-12	1.38351E-07	1.85752E-11
Dermal contact with creek water	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d						4.00E-03									7.00E-04	2.00E-02	2.00E-02
	Hazard Quotient	HQ	mg/kg-d						9.57215E-10						1.97078E-09	1.04423E-09	1.1326E-08	5.02933E-09	6.91754E-04	9.28758E-10
	Total Hazard Index	HI	mg/kg-d						9.57215E-10						1.97078E-09	1.04423E-09	1.1326E-08	5.02933E-09	6.91754E-04	9.28758E-10
	POE concentration	C <sub>w</sub>	ug/l	2.99297E-07	1.71027E-07	1.11168E-07	1.8813E-07	7.69621E-06	0.003648704	1.21429E-06	1.12878E-06	9.13887E-09	5.26519E-09	0.005342537	0.000774668	0.000205232	0.002226	3.4596E-05	1.35956262	0.000182537
	event duration	tevent	hr																	
Dermal contact with creek water	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	1.80907E-13	7.91158E-13	5.51653E-13	1.48195E-12	3.78617E-10	1.36534E-10	3.17844E-12	5.06557E-12	4.16175E-14	2.36346E-14	3.17633E-11	1.55078E-10	6.52686E-11	3.77871E-11	1.99165E-12	1.07752E-07	2.8797E-12
	Event frequency	EF	events/day																	
	Exposure duration	ED	y																	
	Exposure frequency	EF	d/y																	
	Skin surface area	SA	cm2																	
Dermal contact with creek water	Body weight	BW	kg																	
	Averaging time	AT	d/y																	
	Averaging time non-carcinogens	AT <sub>nc</sub>	d																	
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	2.27224E-12	9.93714E-12	6.9289E-12	1.86136E-11	4.75552E-09	1.7149E-09	3.9922E-11	6.36248E-11	5.22726E-13	2.96857E-13	3.98954E-10	1.94782E-09	8.1979E-10	4.74415E-10	2.50156E-11	1.35399E-06	3.61698E-11
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	5.50E-02	2.35E-01	2.35E+00	2.30E-02	7.30E-02	1.10E+00				6.20E-02	1.30E-01	8.40E-02
Dermal contact with creek water	Risk	R <sub>i</sub>	fraction	9.09E-13	3.97E-12	2.77E-12	7.45E-12	1.90E-09	9.43E-11	9.38E-12	1.50E-10	1.20E-14	2.17E-14	4.39E-10				1.15E-11	2.94E-11	3.04E-12
	Total carcinogenic risk for exposure route		fraction																	
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	6.62737E-12	2.89833E-11	2.02093E-11	5.42897E-11	1.38703E-08	5.0018E-09	1.16439E-10	1.85572E-10	1.52462E-12	8.65833E-13	1.16362E-09	5.68114E-09	2.39105E-09	1.38429E-09	7.29622E-11	3.94738E-06	1.05495E-10
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d						4.00E-03						4.00E-02	3.80E-03	2.00E-02	7.00E-04	6.20E-03	2.00E-02
	Hazard Quotient	HQ	mg/kg-d						2.71449E-06						1.42028E-07	6.29225E-07	6.92147E-08	1.04232E-07	0.000436674	5.27476E-09
	Total Hazard Index	HI	mg/kg-d						2.71449E-06						1.42028E-07	6.29225E-07	6.92147E-08	1.04232E-07	0.000436674	5.27476E-09
Carcinogenic risk - all routes (detected organics)																				
Carcinogenic risk - all routes (undetected organics)																				
TOTAL CARCINOGENIC RISK - ALL ROUTES			Sum Ri	fraction	2.37E-06	9.77E-06	5.60E-06	1.67E-05	3.79E-03	1.42E-04	2.27E-05	3.32E-04	2.40E-05	8.29E-06	3.64E-04	0.00E+00	3.67E-05	1.47E-06	1.75E-07	0.00E+00
Non-Carcinogenic risk - all routes (detected organics)																				
Non-Carcinogenic risk - all routes (undetected organics)																				
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES			Sum HI	fraction	0	0	0	5.407687156	0	1.803352269	0	0	0	0	0	0.001099049	1.372095534	0.003469286	0.002185746	31.9099987



TABLE 7-28  
RME RISK CALCULATIONS FOR ADULT RESIDENT (LOW TCE SLOPE FACTOR, WELL A)  
Missouri Electric Works, Cape Girardeau

				Chemicals of Potential Concern											
Exposure Route	Parameter	Symbol	Units	Indeno[1,2,3-cd]Pyrene	2-methylnaphthalene	Naphthalene	Nitrobenzene	Nitrosodipropylamine	Pentachlorophenol	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Total	% Contribution	
	Inhalation Cancer Slope Factor	CSF <sub>inh</sub>	kg-d/mg	3.08E-01						2.10E+00	6.00E-03	3.00E-02			
	Risk	R	fraction	0.00E+00						5.29E-04	4.28E-06	4.79E-07			
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.99E-06	16%	
	Average Intake from Inhalation non-carcinogens	I <sub>h</sub>	mg/kg-d	0	0.000248086	2.68047E-05		0	0	0.000735403	0.002080685	4.66128E-05			
	Inhalation Reference Dose	RfD <sub>inh</sub>	mg/kg-d		8.57E-04	5.71E-04				1.40E-01	1.14E-02	2.86E-02			
	Hazard Quotient	HQ	mg/kg-d		0.289481754	0.046943397				0.005252877	0.182516222	0.001629818			
	Total Hazard Index	HI	mg/kg-d										3.22E-01	61%	
Incidental ingestion of creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	POE concentration	C <sub>w</sub>	mg/m3	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	Water Ingestion rate	IR	l/d												
	Exposure frequency	EF	d/y												
	Exposure duration	ED	y												
	Body weight	BW	kg												
	Averaging time carcinogens	AT <sub>c</sub>	d												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Average Intake from Ingestion carcinogens	I <sub>g</sub>	mg/kg-d	1.837E-16	5.00059E-11	5.40294E-12	2.51638E-10	2.69711E-13	2.93462E-11	1.02354E-09	1.13393E-11				
	Ingestion Cancer Slope Factor	CSF <sub>g</sub>	kg-d/mg	7.30E-01			7.00E+00	1.20E-01	5.40E-01	6.00E-03	7.20E-01				
	Risk	R	fraction	1.34E-16			1.76E-09	3.24E-14	1.58E-11	6.14E-12	8.16E-12				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.91E-06	0%	
	Average Intake from Ingestion non-carcinogens	I <sub>g</sub>	mg/kg-d	5.35793E-16	1.45851E-10	1.57586E-11	7.33945E-10	7.86657E-13	8.5593E-11	2.98533E-09	3.30728E-11				
	Ingestion Reference Dose	RfD <sub>g</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	3.00E-04	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		7.29253E-09	3.15171E-08		2.62219E-11	8.5593E-09	9.95109E-06	1.10243E-08				
	Total Hazard Index	HI	mg/kg-d										1.22E-05	0%	
Dermal contact with creek water	POE concentration	C <sub>w</sub>	ug/l	5.26519E-09	0.001433262	0.000154858	0.007212425	7.73042E-06	0.000841116	0.029336582	0.000325004				
	event duration	t <sub>event</sub>	hr												
	absorbed dose per event	D <sub>event</sub>	mg/cm2-event	2.49849E-14	2.00333E-10	2.52675E-12	5.27912E-11	1.93543E-11	1.04633E-10	1.06659E-09	4.46083E-12				
	Event frequency	EV	events/day												
	Exposure duration	ED	y												
	Exposure frequency	EF	d/y												
	Skin surface area	SA	cm2												
	Body weight	BW	kg												
	Averaging time	AT	d/y												
	Averaging time non-carcinogens	AT <sub>nc</sub>	d												
	Absorbed dose for carcinogens	DAD <sub>c</sub>	mg/kg-d	3.13842E-13	2.51624E-09	3.17365E-11	6.6307E-10	2.43095E-10	1.31422E-09	1.33966E-08	5.60291E-11				
	Dermal Cancer Slope Factor	CSF <sub>der</sub>	kg-d/mg	2.30E-01			1.80E+00	1.20E-01	5.40E-01	9.00E-04	7.20E-01				
	Risk	R	fraction	7.22E-14			1.19E-09	2.92E-11	7.10E-10	1.21E-11	4.03E-11				
	Total carcinogenic risk for exposure route	R <sub>t</sub>	fraction										1.91E-06	0%	
	Absorbed dose for non-carcinogens	DAD <sub>nc</sub>	mg/kg-d	9.15373E-13	7.33902E-09	9.25449E-11	1.93395E-09	7.09027E-10	3.83315E-09	3.90735E-08	1.63418E-10				
	Dermal Reference Dose	RfD <sub>der</sub>	mg/kg-d		2.00E-02	5.00E-04		3.00E-02	1.00E-02	4.50E-05	3.00E-03				
	Hazard Quotient	HQ	mg/kg-d		3.66951E-07	1.8513E-07		2.36342E-08	3.83315E-07	0.000868301	5.44727E-08				
	Total Hazard Index	HI	mg/kg-d										1.22E-05	0%	
Carcinogenic risk - all routes (detected organics)														5.53E-03	
Carcinogenic risk - all routes (undetected organics)														1.82E-03	
TOTAL CARCINOGENIC RISK - ALL ROUTES														7.34E-03	
Non-Carcinogenic risk - all routes (detected organics)														4.65E+01	
Non-Carcinogenic risk - all routes (undetected organics)														6.14E+00	
TOTAL NON-CARCINOGENIC HAZARD INDEX - ALL ROUTES														5.27E+01	